APPENDIX A

City of Tulare

Board of Public Utilities

HYDROLOGICAL ENTERPRISE FUND PROGRAM

(Water, Wastewater, Surface Water)

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DEFINITIONS

BPU or Board: The City of Tulare Board of Public Utilities. The Board is established by City Charter and is responsible for oversight of all City utility enterprise funds.

BUSINESS DAY: Monday through Friday are deemed business days.

BUSINESS HOURS: Hours between 8:00 a.m. and 5:00 p.m. within a Business Day.

HEP: The Hydrological Enterprise Program described within this document.

LEAN: A system of process improvement and project management that strives to eliminate non-value added tasks (so-called, "waste") in order to delivery what customers value and are willing to pay for ("voice of the customer") while meeting the needs of the City ("voice of the business").

LIFE CYCLE COST OF SERVICES: An analytical net present value method for evaluating capital asset related disbursements and to compare solution alternatives with regard to long-lived projects. This method is described in footnote 12 within appendix C in the EPA publication, Effective Utility Management. The method takes into account cash flows that happen when the asset or solution is purchased and placed in service, net cash flows over the functioning life of the asset or solution, and net cash flows at the time of disposal of the asset or termination of the solution.

MID-KAWEAH GROUNDWATER SUSTAINABILITY AGENCY: A joint powers authority comprised of the cities of Tulare and Visalia and the Tulare Irrigation District formed to achieve compliance with the Sustainable Groundwater Management Act (SGMA) implemented by the State of California.

RESERVES: Sums of cash and investments (and other cash-equivalents that are readily liquid and convertible to cash) held for various contingencies and uncertainties.

VOICE OF THE BUSINESS: Policies that reflect the need of the business (in this case, the City) to survive to produce the customer-valued products. The voice of the business explains why the products are produced.

VOICE OF THE CUSTOMER: Expressions of those who receive the services rendered by the City (customers). These customer expressions reflect the products wanted, demanded and delighted in. Customers value tasks and actions that add value to the product for which they are willing to pay.

WATER BUDGET: An evaluation of all the sources of supply and the corresponding discharges with respect to an aquifer or a drainage basin. (Definition copied from glossary, *C.W. Fetter, Jr., Applied Hydrogeology, 1980, page 480).*

WATER CONSERVATION STAGE: Conservation stages established by the BPU pursuant to the City's ordinance.

1. INTRODUCTION

1.1 SCOPE

This document contains the strategic business plan for the City of Tulare's Hydrological Enterprise Program (HEP). The HEP is described more fully in chapter two, but essentially it involves striving for excellence in all aspects of municipal water services and recognizes that water operations are broad in scope and include: all aspects of managing the underground aquifers where water is stored (the City's water supply) through delivery of potable water to City residents (water deliveries) through recovery of contaminated water (both sewer and surface water) for cleansing to be suitable for re-use and return of the cleansed water for subsequent beneficial re-use. The Board recognizes that such excellence is only likely to be achieved through coordinated and comprehensive planning and implementation and controls.

1.2 PURPOSE

This document presents the Board's vision about how the City can operate an excellent Hydrological Enterprise Program (HEP) by implementing each strategy and tactic. The goals include effectively and efficiently operating a reliable municipal HEP with integrity (as demonstrated by both financial and operational performance standards) that safeguards City assets and complies with all laws, regulations, policies, procedures, and contracts. This document also defines the key performance measures by which the Tulare Board of Public Utilities can monitor and assess whether the operations are improving toward the desired "excellence" standard.

1.3 DOCUMENT ORGANIZATION

This document is organized around the strategic vision statement: The City of Tulare intends to optimally and financially responsibly operate municipal water and natural resources enhancement services over specified time horizons, in a planned fashion.

Each phrase above can be thought of as a grouping of strategies and related tactics. Section two summarizes the entire strategic breakdown and discusses the strategic concepts. The following sections describe the "tactics" to implement those strategies.

Each tactic is analyzed using the Six Sigma structural approach to improvement called DMAIC – **D**efinition (of the problem or key concepts), **M**easurements (for use in controlling operations), **A**nalysis (Alternatives considered and why the tactic is selected; **I**mplementation (Details on implementation; and **C**ontrol (how to maintain the tactical implementation and monitor it for successful implementation.

2. HYDROLOGICAL ENTERPRISE PROGRAM (HEP) STRATEGIES OVERVIEW

Rather than looking at its water and sewer (and related wastewater pollution control) and surface water operations as separate stand-alone functions, the City of Tulare has recognized the cyclic interrelationship among the various functions dealing with water. This viewpoint causes the City to structure its Municipal Water operations broadly in terms of supply (which comes from recharge through its surface water management and underground water storage in the Kaweah groundwater sub basin), in terms of the water delivery system, in terms of the used water collection and pollution remediation systems (both its surface water recovery system and sewer collection system and wastewater pollution control facilities (which include both the wastewater treatment plant and the surface water basins), and in terms of returning cleaned water to beneficial re-use and recharge.

The surface water recovery system (gutters, street sweeping, pipelines, and basins) include facilities to collect surface water, clean it and recharge the groundwater. Excluded from the HEP concept are those facilities used solely for flood management during storm events. Flood control is a general government function presently funded by the City's General Fund. Flood control encompasses what has traditionally been described as "Storm Water" management since this excessive water problem only occurs during storms events. Even then, however, the surface water management facilities capture as much of the rain events as possible to maximize recharge from the runoff. All recharge adds to the City's water supply; the groundwater sub basin.

The rest of this section briefly explains each strategy; detailed metrics, implementation and control features are discussed separately in the sections that follow.

2.1 OPTIMALLY

The program starts by recognizing that the services are rendered to "customers." These customers want value and are willing to pay for such value, but they do not want to pay for activities in which they see no value. Customers want the City to eliminate non-essential non-value activities from its HEP (non-value activities are also called "waste" in LEAN). Customers express what they value and it is important that the City design the HEP around this "voice of the customer."

For the organization to survive to serve the customers, the needs of the business must also be met. These needs comprise the "voice of the business." This later voice sometimes requires that certain non-value added activities be undertaken because they are essential to the City implementing the HEP. For example, customers might not expressly value "planning" as a function in and of itself (technically making it a "non-value added activity), but this activity must be performed and funded to be able to deliver the valued products desired. The "voice of the business" often calls for the conducting of essential-non-value-added activities.

This business plan recognizes the reality of “trade-offs.” Most frequently, there is a trade-off between the quality or quantity or timely reliability of water desired and the costs required to meet those expectations. Customers want the greatest amounts of what they desire for least cost or undesired trade-offs. This is the concept of optimization; achieving the best of all circumstances reasonably possible.

Examples of goals that customers might wish to optimize in the HEP are the following:

- Quality potable water delivered on demand on a 365 day/24 hour/day basis
- Communications and information about the HEP
- Fine-tuned operations and professional performed projects
- Customer service (high) and adverse customer impacts (low)
- Compliance with laws
- A water and pollution control system that the City can be proud about
- Financial impacts (the requirement that customers pay for the value received)

To achieve some of these goals may require trade-offs with regard to some of the other goals.

2.2 FINANCIALLY RESPONSIBLE

Financially responsible is a robust concept with many nuances. At its simplest it means having enough financial resources to accomplish the goals satisfying both the voice of the customer and the voice of the business.

Factors of financial responsibility include setting rates and fees to cover costs, making sure there are enough resources (reserves) to withstand the happening of the expected, “unexpected” events inherent in operating the program. Cash Reserves also provide flexibility to allow the City to take advantages of opportunities for great long term benefits.

The financially responsible strategy also encompasses how much of the capital programs are paid for by long term debt as opposed to being paid through accumulated savings (so called, “pay-as-you-go).

Finally, this strategy includes identifying appropriate measurements (performance metrics) for the Board to be able to monitor its finances periodically to assure that the City is succeeding in this strategy and adhering to Board policies. Once determined, the strategy dictates that certain “accounting” structures be established to collect, classify and report data into usable information formats.

2.3 OPERATE

The City operates its HEP through a myriad of standards, objectives, and activities. Through these operations the customers actually receive the products they value (as reflected by their willingness to pay for the products).

Operations strategies include staff related policies and procedures (including without limit, safety and training and succession planning), arranging operating structures to encourage their costs as fixed or variable, measuring process inputs, and measuring process outputs.

A significant driver of inputs, outputs, fixed and variable costs is the capital program. Once capital is employed it must be maintained and eventually rehabilitated and even replaced. In evaluating capital assets certain risk-based programs can be implemented to evaluate processes in terms of failure risk, failure impacts, and costs to maintain. Again, the concept of optimization becomes a critical gauge for such exercises.

Reliability is a very important product attribute for the HEP. There must be risk-based decisions made about maintenance, adequate inventories of critical parts, staffing and the other factors of production. While risk cannot be totally eliminated, various risks can be mitigated and minimized.

2.4 MUNICIPAL WATER

The City operates municipal water (and pollution control and recharge) systems in the fullest meaning of the concept. In addition to complying with all laws and regulations regarding water and pollution control activities and surface water management, both the water and wastewater systems operate subject to specific State issued permits. There permit terms and specifications (minimums) are incorporated by reference as part of the City's operating specifications. The HEP also seeks to meet customer expectations regarding water pressure, water quality (including waters recharged), fire suppression capacity, and a long term planning and managerial view, among other performance attributes.

2.5 NATURAL RESOURCES ENHANCEMENT AND PRESERVATION

Water supply presently comes completely from the underground aquifer. This makes stewardship of this natural resource of utmost importance. The City participates in the Mid-Kaweah Groundwater Sustainability Agency and undertakes extensive recharge and pollution control and remediation measures to assure this source of supply. The City will approach this strategy in the context of its optimizing strategy.

2.6 SERVICES

The City's approach starts with listening to the "voice of the customer," and a customer-centered orientation permeates the HEP. The customer-centered orientation constantly seeks to understand what customers "value," as evidenced by what they are willing to pay for the products they receive. This approach also invites investigation about what can be included as customer "delighters" whereby the City delivers even more than customers actually pay for, such as customer friendliness, complaint responses that meet the needs where possible, and other positive two-way communication. The benefit of such delighters to the City comes in the form of support for programs and easier conversations about rates and fees.

One of the more important aspects of communication has to do with water conservation (whatever the active stage). It is probable that water resources in the Central Valley (and perhaps in all of California) are experiencing paradigm shift. It is possible that the City's Stage Three Water Conversation Stage is the "new normal." The City will seek tactics and programs to lessen the adverse customer impacts caused by this new paradigm. This also means encouraging development and irrigation changes that permanently eliminate water uses that are deemed less than beneficial.

2.7 OVER A SPECIFIED TIME

Time horizons play a significant role in HEP planning and implementations. Time horizons apply to financial planning and rate-setting, work plans; asset replacement and rehabilitation; capital maintenance periods. Specifying expectations regarding deadlines and time horizons will help staff and the Board assures that schedules are being kept. The horizons should be established so that current work plans and decisions do not inadvertently create major problems in the time immediately after the implementation period. Longer planning horizons provide a margin of safety with regard to such risks.

2.8 IN A PLANNED FASHION

This strategy recognizes that the above strategies cannot reasonably be expected to happen absent significant planning effort. This means that the City may need to contract for major planning where it cannot afford to keep adequately trained staff on a permanent basis or where planning continuity cannot be assured by using City staff.

This also means that the City must constantly collect the data and turn it into useful information on a real-time basis. Good planning cannot occur without solid information and a sound understanding of the financial, operational, regulatory, human nature, and scientific bases on which the entire HEP rests. Again, the strategy of optimization must be heavily exercised in the planning area because if there were a way to operate the HEP without any

planning, most customers would prefer to do so to avoid the costs. Planning is essential non-value added activity so it should constantly be scrutinized for any forms of waste, such as: “excess inventory” (of plans), “overproduction” and “excess processing.”

3. OPTIMALLY

Tactic: Staff will consider alternatives when implementing any HEP action.

Define: It is impossible to optimize marginal benefits without considering alternatives.

Measurements: Staff reports will begin recommendation discussions with a list and count of the alternatives considered. Where possible, staff will compute the savings and other benefits of selecting the recommended alternatives.

Analysis: It is expected that the costs of additional analysis will be more than offset by the benefits achieved by systemized consideration of alternatives.

Implement: This tactic will be implemented through staff reports.

Control: Senior Management review of Staff reports.

Tactic: Staff will explicitly consider and address trade-offs with regard to recommendations to the Board.

Define: It is impossible to optimize with explicitly considering the trade-offs.

Measurements: Staff reports will include trade-off analyses as part of discussions regarding proposed Board actions.

Analysis: It is expected that the costs of additional analysis will be more than offset by the benefits achieved by systemized consideration of trade-offs. Although this tactic is specifically targeted for Board presentations, staff is encouraged to approach internal decisions in similar fashion.

Implement: This tactic will be implemented through staff reports.

Control: Through Senior management review of staff reports.

Tactic: Senior City Management staff will apply this optimizing principle when developing all work plans and financial plans.

Define: An optimizing (recognizing trade-offs and seeking greatest marginal benefits) is a mindset to be implemented throughout the HEP.

Measurements: No metric presently specified.

Analysis: Several strategies will only be effective if approached from an optimizing mindset.

Implement: This tactic will be implemented by Senior Management with appropriate training on a periodic basis.

Control: Periodic review of this document.

4. FINANCIALLY RESPONSIBLY

4.1 General

Tactic: "Cash needs" computations will be used as the basis for financial planning and rate setting; HEP spending will be limited to available cash resources, but management will prioritize making sure that needed resources are made available through service revenues and other sources.

Define: The "voice of the business" dictates that the City has access to available cash flow to operate the HEP in manner that assures program survival.

Measurements: Total cash inflows, over all planning horizons, must equal all cash outflows and reserve requirements, as shown in financial reports.

Analysis: This strategy is at the heart of being able satisfy customer wants, demands, and delighters while also being able to continue to provide the HEP in a manner that complies with all laws and Board objectives.

Implement: This tactic will be implemented by Senior Management with appropriate training on a periodic basis.

Control: Board reporting schedule and annual budget preparation process.

Tactic: One hundred percent (100%) pay-as-you-go funding will be the basis for cash needs analysis and paying for the following:

a. All ordinary operating and maintenance costs;
b. Existing payment obligations (whether debt or otherwise)
c. Payment for and correction of existing system deficiencies
d. Routine five year CIP type 1 and type 2 (see definitions) projects/operations

Define: Periodic costs for period benefits are, to the extent possible, to be matched to periodic rate payments for those periodic benefits to achieve intra-period equity among ratepayers.

Measurements: Cash inflows must equal cash outflows when segregated and must still provide for excess cash flow for other defined cash needs.

Analysis: To the optimal extent possible, it is most equitable for current ratepayers

to pay current costs. Debt is sometimes helpful in spreading the cash payments over the period of benefit. Similarly, combinations of accumulated cash and debt (past use and future benefit) can be helpful in achieving intra-period equity among customer bases.

Implement: This tactic will be implemented through constant financial record and report analyses and through the setting of rates to achieve this purpose. It will also be prudent to use debt financing at times to achieve the intra-period equity.

Control: Periodic Board budgetary and financial planning review.

Tactic: Debt will be issued for:

a. Large projects with extended useful lives (for example, type 3 projects)
b. Surplus capacity creating projects for future expansion (interest carrying costs are to be included for repayment in expansion financing instruments such as, but not limited to, development impact fees);
c. Urgent health and safety essential projects without other funding sources;
d. Large regulatory compliance related projects without other funding.

Define: Debt can help achieve intra-period equity among ratepayers.

Measurements: No metric presently specified.

Analysis: Like pay-as-you-go funding, debt funding can be used to achieve intra-period equity so that ratepayers in every time are paying for the full costs of the service and product benefits received. Where capacity is purchased in advance of its need, those who will benefit by the capacity created for them can pay the “carrying cost” measured in interest for creating the asset in advance of their benefit period. This is required in the HEP because many infrastructure assets must be created as once and cannot be created incrementally (for example, one cannot construct ½ a water well). Also HEP infrastructure assets can have very long useful lives, e.g., 80 years for residential pipelines.

Implement: This tactic will be implemented through constant financial record and report analyses and through the setting of rates to achieve this purpose. Staff will seek other outside funding sources, such as grants, litigation (if injury caused by others), and donations whenever possible to reduce the amount of debt financing required.

Control: This tactic will be implemented through constant financial record and report analyses and through the setting of rates to achieve this purpose.

Tactic: Economic value will be optimally recovered from all HEP commodity output.

Define: The HEP processes produce outputs that can have economic value such as treated water, methane gas, bio-solids, etc.… The City will optimize the economic and practical benefits of those outputs to benefit customers.

Measurements: Outside sales of recycled or remediated wastewater, bio-solids, methane gas and other commodity outputs will be accounted for separately and the amounts of these outputs sold will be monitored.

Analysis: Optimizing the beneficial of all program byproducts can help reduce customer rates.

Implement: Accounting line items will collect the revenue information related to each commodity sale.

Control: Financial reports.

Tactic: Regularly assess service rates for adequacy by comparing to benchmarks.

Define: Rates will be considered in relation to factors such as external economic trends, short-term financial management, long-term financial management and other variable factors that may affect the financial viability of the HEP.

Measurements: Finance Cost Accounting personnel will develop and define a suite of key rate adequacy metrics and benchmarks, which will include at least the following:

a. Comparison of rates over time to inflation rates;
b. Comparison of rates with other water providers:
c. Full Life-Cycle Cost of Service analyses;
d. Multi-year cash flow analyses;
e. Various triggers as identified in this Plan.

Analysis: The metrics above, and others that may be developed, are suitable for checking rate adequacy and fairness.

Implement: The Finance Department will develop a reporting format and schedule satisfactory to the Board.

Control: Board reports.

4.2 DEBT MANAGEMENT

Tactic: The City will comply with its debt covenant ratios and will manage its rates and revenues and disbursements (cash flows) to assure long term satisfaction of these terms and conditions.

Define: Achieving debt covenant ratio compliance requires margins of safety around a specific target ratio.

Measurements: The following ratios will be used:

a. Minimum ratio – Debt instrument specific (typically 1.25X)
b. Target ratio – Minimum ratio plus 15 basis points (typically 1.40X)
c. Trigger ratio – Minimum ratio plus 5 basis points (typically 1.30X)
d. Upper trigger ratio – 1.55X

Analysis: Ratio covenant terms are defined for each debt in the issuing debt instruments. However, typically they are computed as follows: Coverage Ratio = system revenues/debt service payments. Most City debt has historically had a minimum coverage ratio of 1.25X) using the foregoing formula.

Implement: The Target Ratio is the ratio the City will strive to maintain through rates and fees and revenues, but if the ratio falls below the minimum coverage ratio plus five basis points (typically 1.30X), absent unusual circumstances the City will begin a rate study to adjust its service charges revenues. if the ratio falls below the minimum coverage ratio plus five basis points (typically 1.30X), absent unusual circumstances the City will begin a rate study to increase its service charges revenues. Achieving a coverage ratio of 1.65X will trigger a rate study to consider reducing rates. The coverage amounts will not consider amounts used to fund reserves until such times as the reserves exceed their maximum amounts.

Control: Staff will annually report the preceding fiscal year's coverage ratios achieved (along with reserve amounts) during the budget preparation process.

Tactic: The City will monitor its Fixed Charges Ratio (FC).

Define: Revenues must cover both debt service and fixed costs.

Measurements: The following ratios will be used:

a. Minimum ratio – 1.0X
b. Target ratio – 1.0X – 1.20X
c. Trigger ratio – 1.35X

Analysis: The FC ratio assures there are adequate revenues to pay fixed costs after paying debt requirements. Subtracting debt service from total revenues gives Remaining System Revenues (RSR). FC Ratio = RSR/Fixed Costs.

Implement: The Target Ratio is the ratio the City will strive to maintain through rates and fees and revenues. If the ratio falls below the minimum or exceeds the Trigger Ratio, then rates should be reviewed for adjustment. The above computations will not consider amounts used to fund reserves until such times as the reserves exceed their maximum amounts.

Control: Staff will annually report the preceding fiscal year's FC ratio achieved (along with reserve amounts) during the budget preparation process.

Tactic: Debt levels relative to asset age (and therefore typical maintenance costs) will be balanced.

Define: The target is for debt costs plus maintenance costs to remain at steady levels as assets age and are replaced even if the mix of debt to maintenance costs vary.

Measurements: The following Debt/Plant Cost ratio metrics as compared to levels of accumulated depreciation are evaluated to maintain the balances indicated together:

Expected Plant Age	Debt/Plant Percentage	Accumulated Depreciation/ Plant Costs Percentage
Older Plant	<40%	>60%
Optimal Age	41% – 60%	51% - 60%
Newer Plant	61% - 80%	35% - 50%
Very New	>80%	<25%
(Rate Trigger)	>100%	N/A

Analysis: Although seemingly complex, the above metrics represent a fairly straight-forward idea: New assets with higher related debt interest costs

should require less maintenance (because they are new) than older assets (with lower interest costs, but typically higher maintenance costs).

The standards above reflect the typical situation where there is more debt right after a major expansion (with significant new equipment), but then less maintenance required for a time. The maintenance factor is computed by using a proxy of accumulated depreciation (the total of all years of depreciation expense) which is then divided by total plant cost. Debt/Plant costs reflect the typical situation where debt is used to finance plant capacity expansion.

Typically, both of the above ratios should tend to be about 50%. Higher debt/plan ratios indicate that the plant should be newly purchased so there will have been fewer years to accumulate the annual depreciation. When accumulated depreciation becomes more than 50% it indicates that assets are not being consistently replaced and there may be a higher percentage of older asset components that are part of the system.

Implement: If the debt/plant cost percentage exceeds 100% it is an indication that rates should be reviewed for a possible increase as soon as possible. If both debt costs and accumulated depreciation are high then there may be an issue with not timely replacing older assets. If these ratios suggest such a situation it calls for review of maintenance costs and the reasons for deferred replacement and rate increases may be needed. If component maintenance costs are able to better developed then instead of using accumulated depreciation as the proxy, the percent of maintenance costs to plant costs could be better employed.

Control: Staff will annually report the preceding fiscal year's coverage ratios achieved (along with reserve amounts) during the budget preparation process.

4.3 ACCOUNTING COST CENTERS

Tactic: Classify costs within each of operational segment (water, sewer, surface water management, etc...) to allow analysis of fixed cost and variable cost information and for purposes of rate setting support.

Define: Specific fixed and variable cost information is required by pertinent cost center to adequately compute defensible rates to support the HEP.

Measurements: Board and Consultant evaluations of the adequacy of the City's cost centers and accounting structure to achieve managerial accounting and rate setting objectives. Consultants will be asked to rank the utility of the cost centers on a scale of from 1 (lowest) to 5 (highest).

Analysis: Proposition 218 requires sufficient evidence to support rates and rate structures to recover program costs and adequately fund reserves.

Implement: Meaningful cost centers will reported to the Board in the regular financial reports, and adequate cost centers will be established and maintained in the City's account for managerial and rate setting accounting.

Control: Consultants will be asked to make improvement suggestions with regard to any rate or fee setting assignments with regard to the City's chart of accounts.

Tactic: Regularly report key activity cost related metrics to the Board.

Define: Specific fixed and variable cost information and key activity performance metrics assist the Board in measuring routine HEP performance.

Measurements: The Finance Cost Accounting personnel will develop and define a suite of key performance metrics, which will include at least the following:

a. Annual and historical cost per metered account;
b. Quarterly and annual cost per thousand gallons (Tgal) of:
    a. Water pumped (at the well),
    b. Water recharged (intentionally and though leakage),
    c. Wastewater treated;
c. Annual and lifetime cost per water well;
d. Annual and lifetime cost per hundred acre-feet of groundwater recharge;
e. Fixed and variable costs per major HEP operating segment (Water, Domestic and Industrial Pollution Control, Surface Water Management) and division (e.g., water supply, water transmission, WWPCP, Domestic Sanitary Sewer collection, Industrial sewer collection, HEP administrative costs, Regulatory compliance, etc…).

Analysis: The metrics above, and others that may be developed, are to be suitable for use in benchmarking with investor-owned and other municipal systems providing similar programs.

Implement: The Finance Department will develop a reporting format and schedule satisfactory to the Board.

Control: Board reports.

4.4 RESERVES

Tactic: Adequate Water operations-dedicated reserves will be maintained to assure operating and opportunistic flexibility, cash flows, and to provide for economic uncertainty.

Define: The water supply and delivery system requires reserves for normal cash flows during lower sales volume months (typically in the fall and winter) and for expected "unexpected" contingencies such as the loss of a major customer, economic downturns, or sales restrictions imposed because of the State water conservation ordinances.

Measurements: Reserve levels will be targeted within the following minimum/maximums with the actual target in the midpoint of the stated ranges:

a. Sixty to one hundred twenty day operating reserve with rate review triggers when the reserve levels equal sixty days (potential increased cash flows needed) or one hundred fifty days (potential to reduce cash flows).
b. Economic uncertainty reserves between $250,000 and $350,000 for events and incidents of a type illustrated by the following:
    i. Loss of a large water customer,
    ii. Recession or severe depression,
    iii. Significant unexpected inflation;
    iv. Emergency replacement in an amount less than that requiring accessing the Combined Hydrological Reserve described below.

Analysis: Staff will periodically analyze actual demands made upon these reserves and periodically recommend adjustments to this policy where circumstances warrant.

Implement: Reserves will be funded on an annual fixed amount subject to the targets above. Where reserves are deficient, the Board will implement increases designed to achieve reserve target levels within two years and will include such cash flow needs in rate setting processes. Funding of reserves is a funding priority behind only debt service and normal operations.

Control: Reserve levels will be explicitly reported as part of the annual budget process.

Tactic: Adequate Sewer and Wastewater pollution control operations-dedicated reserves will be maintained to assure operating and opportunistic flexibility, cash flows, and to provide for economic uncertainty.

Define: The sewer collection, surface water management, and wastewater pollution control elements of the HEP require reserves for normal cash flows and for expected "unexpected" contingencies such as the loss of a major customer, economic downturns, or rapid regulatory impositions by the State.

Measurements: The City will target reserve levels within the following minimum/maximums with the actual target in the midpoint of the stated ranges:

a. Sixty to one hundred twenty day operating reserve with rate review triggers when the reserve levels equal sixty days (potential increased cash flows needed) or one hundred fifty days (potential to reduce cash flows).
b. Economic uncertainty reserves between $2,000,000 and $3,000,000 for events and incidents of a type illustrated by the following:
    i. Loss or closure of a large industrial customer,
    ii. Recession or severe depression,
    iii. Significant unexpected inflation;
    iv. Emergency replacement in an amount less than that requiring accessing the Combined Hydrological Reserve described below.

Analysis: Staff will periodically analyze actual demands made upon these reserves and periodically recommend adjustments to this policy where circumstances warrant. Because a relatively small number of industrial

customers comprise significant percentages of revenues, and because of the relative large debt loads related to the capital assets for this element of the HEP, a larger economic uncertainty reserve is required. It is also anticipated that only relative small ($500,000 or less) emergency replacements will be made from the uncertainty reserve to preserve it for the impacts related to the industry "concentration" risk.

Implement: Reserves will be funded on an annual fixed amount subject to the targets above. Where reserves are deficient, the Board will implement increases designed to achieve reserve target levels within two years and will include such cash flow needs in rate setting processes. Funding of reserves is a funding priority behind only debt service and normal operations.

Control: Reserve levels will be explicitly reported as part of the annual budget process.

Tactic: Adequate Combined HEP reserves will be maintained to meet contingencies.

Define: The HEP requires reserves for unexpected failures and significant events. Because of the potential capital costs for infrastructure failures are so significant; a reserve must be available to maintain system reliability and compliance. A combined reserve offers economy in scale where the risks of loss are uncorrelated (a failure in the water system is typically independent of a failure in the surface water management system or in the wastewater pollution control system).

Measurements: The City will target a combined contingency reserve of $5,000,000 with minimum/maximums of $4,000,000 and $6,000,000. Equity funding will come from the following HEP elements:

a. Water - $2,000,000 target,
b. Sewer/Wastewater - $3,000,000 target
c. Surface water management – zero (subject to later review).

Analysis: Staff will periodically analyze actual demands made upon these reserves and periodically recommend adjustments to this policy where circumstances warrant. Because the loss risks are deemed to be uncorrelated the combined reserve should be able to be maintained at a level less than each element of the HEP would need independently. The Surface Water Management reserve component will be evaluated in the

future once the component-failure risks are better quantified.

Implement: Reserves will be funded on an annual fixed amount subject to the targets above. Where reserves are deficient, the Board will implement increases designed to achieve reserve target levels within three years and will include such cash flow needs in rate setting processes. Funding of reserves is a funding priority behind only debt service and normal operations. Where a HEP element draws on reserves it will increase its annual cash contributions (with appropriate rate adjustments if necessary) to restore its equity share of the fund.

Control: Reserve levels will be explicitly reported as part of the annual budget process.

Tactic: Rate studies will be initiated in response to reserve levels falling below specified sums.

Define: The reserve program is a priority and where reserves levels threaten system integrity, reliability or ability to maintain compliance they must be aggressively restored within a one year period to above trigger amounts.

Measurements: The following rate study triggers apply:

a. Operating reserves – Below thirty days operating costs reserve level.
b. Economic uncertainty reserves – if amounts are less than 80% of the target amounts below at June 30 of any given fiscal year:
    a. Water economic uncertainty reserve – $300,000
    b. Sewer/WW economic uncertainty - $2,500,000,
    c. Combined Contingency Reserve -- $5,000,000.

Analysis: The City must remain flexible and address unexpected large cash outlays in a way that maintain the financial integrity and operational reliability of the HEP elements.

Implement: Rate studies will be begun when the above triggering events occur.

Control: Reserve levels will be explicitly reported as part of the annual budget process.

5. OPERATE

5.1 Staffing

Tactic: Recruit and retain a workforce that is competent, motivated, adaptive, and safe-working.

Define: A critical factor into the HEP is maintaining a competent and stable workforce, including the leadership team.

Measurements: The following metrics apply: Employee Turnover Rate, Employee Job Satisfaction, Training Hours Per Employee, Certification Coverage, Key Position Internal/External Recruitment Ratio, Long-term Succession Plan Coverage Percent.

Analysis: The analysis and source for this tactic is the EPA Effective Utility Management Publication contained in Appendix A; metrics are more fully described in appendix C to that publication.

Implement: Develop an internal set of processes and procedures by December 31, 2016 to fully implement.

Control: Make report on this tactic a required part of the annual budget process.

5.2 Operations Standards

Tactic: Maintain documented and Board approved operating standards.

Define: Operations-critical processes and events will be operated in accordance with Board reviewed and approved standards.

Measurements: Days since last review of standards will not exceed 400 days.

Analysis: Many metrics and criteria are useful in evaluating whether HEP operations are performing as intended. These can range from quality standards, to safety and risk mitigation standards, to product quantity and capacity standards to a range of other performance metrics. While these are developed by Staff they are suitable for review by the Board to make sure they are in place and are pertinent to meeting the wants, needs, and

delights sought by HEP customers.

Implement: Develop an internal set of standards by March 31, 2016 and make first presentation to Board for review and approval on or before June 30, 2016.

Control: Periodic Board review and approval.

5.3 Risk-based Analysis of Operations

Tactic: Implement the risk-based maintenance approach for Type I and Type II Projects as defined in the Ewers Report contained in Appendix B.

Define: A critical factor into the HEP is maintaining the capital infrastructure which includes replacement and rehabilitation of long-life assets that can be very expensive and require accumulation of funds.

Measurements: The following metrics apply with regard to Type I and Type II Projects: Standard (also called “budgeted”) cost versus actual cost and variance (broken between price, quantity, and efficiency), and system risk measures composed of factors for: Likelihood of Failure, Consequence of Failure, Ignorance Factor, and Criticality Rating.

Analysis: The analysis justifying, and source, for this tactic is the Ewers Report contained in appendix B. The following tables provide details regarding the project prioritization rankings, project type categories, and risk-based project analysis factors for reader convenience.

Proposed project prioritization		
Priority	***Classification***	***Explanation***
1	Health and Safety	Required to eliminate or mitigate a threat to public health or safety.
2	Regulatory or court order compliance	Brings facility into compliance with regulatory requirements governing the operations, maintenance, staffing, or financial status or court order.
3	Renewal and Replacement	Provides for continued facility operations at current capacities through renewal or replacement of existing facilities.
4	Facility Longevity	Develops new facility elements or refines facility to enhance the facility longevity or functionality.
5	Increase staff availability and competency	Develops staff capacity or widens the pool of people available to competently accommodate existing operations.
6	Engineered, high pay back	Fulfills mission and function, mitigates or resolves operational issues and inefficiencies, and yields cost savings in operation and maintenance that pay back investment within a five-year period.
7	Engineered, low pay back over long term	Fulfills mission and function, mitigates or resolves operational issues and inefficiencies, and yields cost savings in operation and maintenance that pay for investment over a period longer than five years.
8	Increase public presence	Increases positive public awareness or remediates concerns expressed by citizens or public officials.

CIP project categories	
Type	***Project description***
1	Ongoing, periodic costs or a cost over several years in a programmed O&M expenditure
2	One-time costs, typically for large O&M projects
3	Large capital projects that expand capacity or capability of the WWTF

Likelihood of failure rating values	
Rating	***Definition***
5	High: Near certainty of short-term failure.
3	Medium: Failure will occur in long term.
1	Low: Failure will occur beyond timeframe affected by CIP.

Consequence of failure rating values	
Rating	***Definition***
5	High: Failure disrupts mission, imposes crippling penalties.
3	Medium: Failure generates long-term disruption and increased cost.
1	Low: Failure disruption is negligible.

Ignorance rating values	
Rating	***Definition***
5	High: No data are available, nor are data anticipated.
3	Medium: Data are available that indirectly inform the factor.
1	Low: Data are available that directly inform the factor.

Criticality rating values	
Rating	***Definition***
5	High: Facility and project are integral to immediate operation.
3	Medium: Facility and project are important for long-term operation.
1	Low: Facility and project have minimal impact on operation.

Implement: Use funding developed through rate studies and revenues to implement Ewers Report as suggested and to extend risk-based maintenance to all operational segments of the HEP infrastructure by June 30, 2017.

Control: Make report on this tactic a required part of the annual budget process.

Tactic: Specific identified operational risks will be mitigated with appropriate advance operations related planning.

Define: A critical factor into the HEP is identifying risks to system normal operations and planning to lessen or eliminate (to mitigate) critical risks where possible and within the concept of optimization.

Measurements: The following metrics apply: Critical Assets Inventory Coverage (percent) (total number of critical assets inventoried within a reasonable period of time/ total number of critical assets); Critical parts and equipment resiliency, Critical staff resiliency, Power resiliency, Treatment Operations resiliency, Pipeline miles to be replaced or rehabilitated per year, funds accumulation per year to replace major infrastructure components (Type III projects in the Ewers Report),

Analysis: The analysis and source for this tactic is the EPA Effective Utility Management Publication contained in Appendix A; metrics are more fully described in appendix C to that publication. The Ewers Report contained in appendix B describes the concept of accumulations for capital infrastructure and defines Type III Projects.

Implement: Develop an internal set of processes and procedures by December 31, 2016 to fully implement. Adopt the following replacement or major rehabilitation objectives immediately:

- Pipelines and related appurtenances – 5 miles per year;
- Lift stations – 3 stations per year to cover all stations over 5 years (estimated to cost approximately $150,000 per year)
- Sanitary Sewer Control panels – 1 - 2 panels per year
- Surface and Storm Water lift stations – 2 per year (estimated to cost approximately $100,000 per year)
- Manhole Rehabilitation – 8 per year
- Wells – 1 -2 per year.

Control: Make report on this tactic a required part of the annual budget process and integrate into all rate studies.

5.4 Operational Optimization.

Tactic: Optimize resource usage efficiency, including labor and material per unit of output or mile of collection/distribution system.

Define: To continuously improve HEP operations it is necessary to monitor key indicator of efficiency and effectiveness.

Measurements: The following metrics apply: Customer accounts/Employee, MGD water delivered (or processed)/Employee, Chemical Use/Volume delivered (processed), Energy use/Volume delivered (or processed), O&M cost/Volume delivered (or processed), Meters functioning/Total meters, Water Delivered/Total Water taken into the system, Planned (to total) Maintenance Hours Ratio, and Planned (to total) Maintenance Cost Ratio.

Analysis: The analysis and source for this tactic is the EPA Effective Utility Management Publication contained in Appendix A; metrics are more fully described in appendix C to that publication.

Implement: Develop an internal set of processes and procedures by December 31, 2016 to fully implement and review results during the annual budget process.

Control: Make report on this tactic a required part of the annual budget process.

5.5 Projects Management.

Tactic: Use the Tulare Project Management System to manage all major capital projects and all projects subject to the Tulare Project Management System Policy adopted by the Board.

Define: Efficient management of major projects is critical to the effective management of the HEP.

Measurements: Budget variances by project, schedule variances in days for each project, and number of scope related change orders.

Analysis: The analysis and source for this tactic is the City of Tulare Project Management System Policy and implementing procedures.

Implement: Manage projects using multi-phased approach defined by the policy. Of particular importance are the feasibility analyses (including the alternatives analysis) within the Conceptual phase and the value-engineering portion of the final design phase

Control: Regular Board reports on projects.

Tactic: Perform a “Life-cycle Cost Accounting” (LCA) for significant projects and periodically as part of rate evaluations.

Define: Periodically analysis the impacts of capital decisions on all financial aspects of operations and planning. A LCA incorporates accepted service levels, asset condition, budgeted needs based on net present values of current and future assets.

Measurements: Net Present Values of inflows must equal or exceed those of outflows.

Analysis: The analysis and source for this tactic is the EPA Effective Utility Management Publication contained in appendix A; LCA is more fully described in footnote 12 within appendix C to that publication.

Implement: Perform a LCA before December 31, 2018.

Control: Report to Board on progress of LCA during annual budget process.

6. MUNICIPAL WATER

6.1 Water Pressures

Tactic: Water pressures will be maintained throughout the system in accordance with the Board adopted connection policy.

Define: Water pressures are a key operating standard that affect system development and planning.

Measurements: Water pressures throughout the system will be maintained as follows.

a. Targets: Average daily – 35 p.s.i./Minimum peak – 30 p.s.i.
b. Maximum – Average daily 45 p.s.i./Maximum – 50 p.s.i.
c. Trigger – Average daily – 30 p.s.i./minimum 25 p.s.i.

Analysis: Pressure definition is a major component of water system capacity. This standard affects capital and operating costs and has a direct effect on rates and ability to connect new accounts..

Implement: Regularly monitor historical and project 36 months in advance.

Control: Monitored on reports to the Board in relation to requests for new water connections.

6.2 Water Quality, State Standards, and City Standards

Tactic: Product quality goals will meet minimum legal standards, but will also achieve the greatest quality possible taking the following into account:

Published Public Health Goals, available financial resources, available technology, common sense, stakeholder communications, and reasonably anticipated future events.

Define: State and Federal minimum standards must be met, but the HEP will seek to deliver the highest quality products reasonably feasible.

Measurements: Using State and Federal Standards as an outline, staff will develop its quality dashboards for presentation to the Board.

Analysis: The EPA Effective Utility Management Publication contained in Appendix A describes additional product quality standards and metrics in its appendix C. Generally, however, the City's goal is to provide the highest quality product reasonable under the circumstances in line with what the HEP customers are willing to pay for.

Implement: Develop an internal set of measurement standards that meet or exceed legal minimums by December 31, 2016 to fully implement this tactic.

Control: Make reporting on this tactic a required part of the annual budget process.

6.3 HEP is Water Centered

Tactic: Water management is the core focus of the HEP.

Define: Water is a key resource for all community activities and growth. Water is viewed in the HEP as a resource that cycle from rainfall and surface waters recharge followed by groundwater extraction for potable water delivery followed by wastewater recovery and cleaning and then recharge back into the groundwater basin.

Measurements: Water volumes as trackable within the HEP processes (extraction, leaks, delivered, recovered, recharged, etc...)

Analysis: The entire HEP centers on having adequate quantities and quality of water available for customers.

Implement: Integrate the HEP into rate structures, cost recovery, planning to fully effectuate this enterprise fund concept.

Control: Make report on this tactic a required part of the annual budget process.

7. NATURAL RESOURCES ENHANCEMENT AND PRESERVATION

7.1 Groundwater Management

Tactic: The City will establish a "Water Budget" using industry common standards.

Define: A City Water Budget (for integration with Groundwater Sustainability Agency Water Budgets of the Mid-Kaweah sub-basin) will be developed and maintained.

Measurements: The annual and water cycle net quantities of water extracted as compared to the estimated total sub-basin water recharged

Analysis: It is important for the City be aware of and knowledgeable about the workings of the groundwater sub-basin from whence it gets all of its potable water.

Implement: Incorporate into City planning activities and integrate into City joint efforts through the Mid-Kaweah Groundwater Management Agency.

Control: Make reporting on this tactic a required part of the annual budget process.

Tactic: Target zero net extractions to be shown on the City's Water Budget over the Water Cycle (defined as the years between droughts).

Define: The City of Tulare fully participates in the Mid-Kaweah GSA which will likely set targets for each extractor. However, separate and apart from that regulatory effort, this tactic adopts a goal of "net zero" extractions over the Water Cycle defined above.

Measurements: The annual and water cycle net quantities of water extracted compared to the estimated total sub-basin water recharged and water table levels.

Analysis: This becomes the City's minimum goal for groundwater level maintenance.

Implement: Monitor ground water table levels and monitor the Water Budget compared to the actual amounts of extraction and recharge. This will also require systems to measure rainfall, surface water recharge (both from storms and from return water placed into City streets and on other impervious surfaces).

Control: Make reporting on this tactic a required part of the annual budget process.

7.2 Water Conservation and Demand Management

Tactic: Set permanent and emergency response Water Conservation Stages and their related goals to achieve the target of zero net extractions to be shown on the City's Water Budget over the Water Cycle (defined as the years between droughts).

Define: Set Water Conservation goals to achieve the greater goal of Net Zero Extractions.

Measurements: Board decision on minimum water conservation stage; presently at Stage 3.

Analysis: This tactic is needed to achieve long term planning and to permanently adapt to the water environment. Essentially, the Sustainable Groundwater Management Act appears to be changing the "way of life" approach to groundwater basin management. This change will likely impact what landscaping is installed in the City of Tulare and will make other permanent changes to how water use is planned.

Implement: Currently implemented as Stage 3.

Control: Make reporting on this tactic a required part of the annual budget process.

7.3 Tertiary Treatment and Other Advanced Technology Investments

Tactic: Investments in Advanced Technologies, such as tertiary wastewater treatment, will be evaluated using the "optimization" principle and reasonable rates of return given the relative risks of the investments.

Define: Deliberate processes designed to optimize the benefits when compared to the costs (including without limit, political, environmental, social,

technological, legal, and economic costs) will be used when evaluating water technology investments.

Measurements: Each alternative considered will be identified and estimates of costs, such as those defined above, will be made and reported. A financial analysis using net present value techniques (such as Life-Cycle Accounting) are to be used to develop estimates of rate of return.

Analysis: There are many trends, such as tertiary water, that may be beneficial in some, but not all, circumstances. This tactic is designed to prevent the City from blindly chasing the latest trends and to instead focus on benefits versus costs. One technique for such evaluations may include the Life-Cycle Accounting analysis.

Implement: Follow the provisions of the Tulare Project Management System Policy which is intended to effectuate this tactic City-wide.

Control: Confirm in staff reports recommending new investments that this tactic was employed.

8. SERVICES

8.1 Customer Service Standards

Tactic: Provides reliable, responsive, and affordable services in line with explicit, customer-accepted service levels.

Define: HEP meets reasonable customer demands and wants in terms of water delivery, pollution control and surface water management in a manner consistent with what the customers are willing to pay for the services.

Measurements: Customer complaints as measured by:

a. Customer service complaints per 1,000 customers;
b. Technical complaints (i.e., pressure, leaks, quality, etc…) per 1,000 customers.
c. Customer praises (reverse complaints) and compliments per 1,000 customers.

Analysis: Customer complaints per thousand customers statistics are a quarterly

quantitative method used as a proxy for customer satisfaction measurement.

Implement: Log the call by categories above, and if desired by additional categories (for example, billing issues, interruptions, quality, taste, odor, appearance, flow/pressure) and if desired by type of customer (residential, industrial, commercial, etc…).

Control: Quarterly reports to the Board.

8.2 Responsiveness Standards

Tactic: Receives timely customer feedback to maintain reasonable responsiveness to customer needs and emergencies and provides timely responses.

Define: Systems must be in place to receive and handle customer feedback appropriate to its nature and to the reasonable demands of operating the HEP using the concept of optimizing responsiveness given the costs of doing so.

Measurements: Customer feedback responsiveness measures include:

a. Contact responsiveness = contacts responded to within 24 Business Hours divided by total contacts during the quarter;
b. Error-driven billing adjustment rate = error-driven billing adjustments divided by number of bills generated each month;
c. Service Start/Stop responsiveness = Start/Stop orders processed within the month divided by orders placed during the month;
d. First Contact Problem Resolution by Month = number of "problem contacts" resolved on first staff contact divided by total "problem contacts" per month.

Analysis: Responsiveness to customer problem feedback should be optimized in light of the available call center resources and the need of management to operate the HEP. To this end, the impacts of overly aggressive responsiveness on managers' time and responsibilities and the relative value of immediate access to senior managers versus having all contacts resolved at the staff level closest to the customer (by people who will have

the greatest knowledge of the circumstances) are considered as trade-offs in the implementation standards below.

Implement: Customer feedback must be counted and the pertinent attribute tracked in order to be able to produce the result. This may include requiring a written (may be entered into computer Customer Response Management software) for routing to the appropriate person who can deal with the issue and close analysis of who the correct person to respond to customer feedback should be. These decisions are to be made in a way that optimizes the HEP resources.

To the extent possible, the use of written forms for contacts by customers will be used to optimize resources and provide information for managing this customer service attribute. When the customer is unable to, or refuses, to use a form, staff will take the information verbally and complete the form for the customer. The standard for responsiveness is 24 Business Hours, as that term is defined. Management staff are not required to handle every request of them for a conversation especially when they may not have all the details regarding a circumstance

Control: Quarterly reports to the Board.

8.3 Service Affordability

Tactic: Monitor "Bill Affordability" as defined below.

Define: Bill Affordability means that the HEP bills, and each individual operations segment portion, are no greater than a specified percentage of median household income.

Measurements: Percentage of customers whose bills are estimated to exceed the Bill Affordability and the computation of the actual percentages acheived.

Analysis: This statistic helps the HEP tailor its programs, but also this statistic is important in securing outside grant funding targeting disadvantaged communities, such as the City of Tulare. The City has not traditionally maintained information on this statistic so reasonable standards remain to be developed.

Implement: Obtain estimates of household incomes from the Community Development Department, estimate incomes by household income categories and determine what percentage of those incomes the HEP charges represent. During the next significant rate study related to HEP segment operations this relative percentage should be computed and standards can then be adopted by the Board.

Control: Make report on this tactic a required part of rate setting projects.

Tactic: Monitor Low-income billing assistance programs.

Define: The City of Tulare and outside agencies provide assistance with regard to paying HEP service charges through various billing assistance programs.

Measurements: The number of customers receiving various forms of billing assistance and the amounts of assistance being received, as reflected in HEP billing records.

Analysis: These measures help the Board tailor HEP programs and charges, and also are useful in securing outside grant funding targeting disadvantaged communities, such as the City of Tulare.

Implement: Identify forms of billing assistance recorded in HEP billing programs and report numbers of recipients by each type of billing assistance.

Control: Make report on this tactic a required part of the annual budget process.

9. SPECIFIED TIME HORIZONS

9.1 Capital Replacement

Tactic: Funds for capital asset replacement will equal their estimated useful lives on City's depreciation schedules except the assets described below for which funds will be accumulated according to the lives stated.

Define: HEP must accumulate cash needs to replace HEP infrastructure, mission-critical capital assets.

Measurements: The following capital assets will employ the time horizons indicated for accumulating cash for replacement:

a. Water and residential sanitary sewer pipelines – 80 years;
b. Industrial wastewater lines – 50 years;
c. Domestic wastewater treatment plant – 80 years;
d. Industrial wastewater treatment plant – 60 years
e. Water wells – 40 years.

Analysis: The years in which to accumulate assets will dictate the amounts included in rates for such accumulations.

Implement: Incorporate into rate studies. The goal for pipelines is to replace a minimum of 5 miles per year until current deficiencies are addressed at which time the 80 year useful life estimate may be applied to compute the required number of miles per year.a

Control: Board reports on replacement progress.

9.2 Operating Cycles

Tactic: Type I and Type II projects, as reported in the Ewers Report, will be accomplished on an 8-year cycle.

Define: The risk level associated with an average 8-year cycle within the Ewers Study is adopted so that cash need estimates to meet such a cycle will be folded into rate modeling.

Measurements: Type I and Type II risk-based assessment factors.

Analysis: The criteria in this tactic are adopted as reasonable risk-management choices and in order to optimize system performance and longevity and financial resources applied.

Implement: Incorporate into rate setting.

Control: Board review of rates.

9.3 Rate Setting and Business Plan Updates

Tactic: Define rate setting and business plan update time horizons.

Define: Provide for certain schedules for review of mission-critical financial review tasks.

Measurements: All of the following plans are to be reviewed, at a minimum, on five year cycles or as triggered by other tactics in this Plan:

a. Operational work plans
b. All HEP rates and fees;
c. Development Impact Fees for new expansion;
d. Business Plans;
e. Ten-year Energy Plans;
f. Urban Water Management Plans.

Analysis: This tactic establishes minimum cycles for plan and rate reviews.

Implement: Annually report next scheduled reviews in annual budget report.

Control: Annual budget process reporting.

Tactic: Planning horizons appropriate to the nature of the plans will be used.

Define: Planning horizons are the period over which decisions will be implemented or which will be effected by the decisions made.

Measurements: The following planning horizons will be used:

a. Intermediate term financial plans – 10 years;
b. Long-term Type III project financial plans -- 80 years;
c. Maintenance work plans -- 10 years;
d. Growth and normal capital plant development plans – 30 years
e. Water Supply plans – 40 years.

Analysis: Plans should extend beyond the period of action so that constraining decisions can be avoided or mitigated.

Implement: Use the Measurements above for plan horizons.

Control: Board reports.

10. IN A PLANNED FASHION

10.1 Organized Program Planning – A Priority

Tactic: Planning to achieve a successful HEP is a priority and adequate resources will be devoted to this activity.

Define: The HEP is complicated and requires various plans for successful implementation and to be sure that water is always available for potable delivery and that pollution can be removed from surface water and returned wastewater.

Measurements: Existence of updated short-term (typically budget), intermediate term and long-term HEP plans regarding the following:

a. Financial health and cash need satisfaction;
b. Maintenance and operations work plan;
c. Capital investment plan;
d. Ten-Year energy plan
e. Expansion plan
f. System Customer Connection plan
g. Environmental and Regulatory Compliance plan
h. Staff Succession plan
i. Staff Training and Education plan
j. Urban Water Management Plan.

Analysis: All planning is to be done keeping the principle of optimization in mind. However, given the complexities and interrelatedness of the various HEP components successful achievement is unlikely without sound planning.

Implement: City staff will participate in planning efforts, but the City may either create an internal planning staff dedicated to the planning efforts or may contract with outside consultants who have specialized knowledge. Under either scenario, there will be an ongoing continuous process of planning data collection and classification to allow competent plans for non-interrupted HEP services to be able to be continuously supplied.

Control: Presentation of various plans to the Board.

10.2 Ten-year Energy Plans

Tactic: Develop and administer energy costs, usage and pollution control in accordance with a regularly updated ten-year energy plan.

Define: Energy plans will consider all HEP energy usage and all opportunities for selling or re-using energy commodities produced as well as environmental and regulatory practices.

Measurements: Energy costs, energy consumption, energy produced, and energy revenues.

Analysis: Energy is one of most significant of inputs (and potentially of outputs) with regard to the HEP. It is important to optimize these factors. Given the complexity and changing nature a purposeful organized approach is necessary to optimize outcomes..

Implement: Present the first ten-year energy plan to the Board on or before January 31, 2016.

Control: Regular reporting to the Board.

APPENDICES

Appendix A: Effective Utility Management

Appendix B: Ewers Report

Effective Utility Management

A Primer for Water and Wastewater Utilities

June 2008

United States Environmental Protection Agency
Association of Metropolitan Water Agencies
APWA
American Water Works Association
NACWA
NAWC National Association of Water Companies
Water Environment Federation®

Foreword

Water and wastewater utilities across the country are facing many common challenges, including rising costs, aging infrastructure, increasingly stringent regulatory requirements, population changes, and a rapidly changing workforce. Effective utility management can help utilities respond to both current and future challenges and support utilities in their common mission of being successful 21st century service providers.

Based on these challenges, EPA and six national water and wastewater associations signed an historic agreement in 2007 to jointly promote effective utility management based on the *Ten Attributes of Effectively Managed Water Sector Utilities* and five *Keys to Management Success*.

This Primer is an outgrowth of that agreement and distills the experience of a group of leaders in water and wastewater utility management into a framework intended to help utility managers identify and address their most pressing needs through a customized, incremental approach that is relevant to the day-to-day challenges utilities face. In the future, the Collaborating Organizations will continue to work collectively and individually to implement a range of short-term and long-term actions designed to promote and recognize excellence in utility management based on the principles and practices described in the Primer throughout the water sector.

We, the Utility Advisors and Collaborating Organization representatives who participated in this ground-breaking effort, believe that this Primer will be helpful to both individual utilities and the water utility sector on the whole. Based on our own experience, as well as the experience of others across the country, it is clear that effective utility management is critical to helping utilities address challenges, improve performance, and be successful in the long run. We strongly encourage all utility managers, regardless of their utility's size, budget, and unique circumstances, to read, consider, and implement the strategies and approaches outlined in this Primer.

Sincerely,

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Table of Contents

I. Effective Utility Management

Water and wastewater utilities across the country face common challenges. These include rising costs, aging infrastructure, increasingly stringent regulatory requirements, population changes, and a rapidly changing workforce. While many utility managers find themselves turning from one urgent priority to the next, others have systematically applied effective utility management approaches that have helped them improve their products and services, increase community support, and ensure a strong and viable utility long into the future.

Effective utility management can help water and wastewater utilities enhance the stewardship of their infrastructure, improve performance in many critical areas, and respond to current and future challenges. Addressing these challenges also requires ongoing collaboration between government, industry, elected officials, and other stakeholders.

In May, 2007, six major water and wastewater associations and the U.S. Environmental Protection Agency (EPA) signed an historic agreement pledging to support effective utility management collectively and individually throughout the water sector and to develop a joint strategy to identify, encourage, and recognize excellence in water and wastewater utility management. This Effective Utility Management Primer (Primer) is the result of the agreement among the following organizations:

- Association of Metropolitan Water Agencies (AMWA)
- American Public Works Association (APWA)
- American Water Works Association (AWWA)
- National Association of Clean Water Agencies (NACWA)
- National Association of Water Companies (NAWC)
- United States Environmental Protection Agency (EPA)
- Water Environment Federation (WEF)

Effective utility management is essential to sustaining our nation's water and wastewater infrastructure.

This Primer is designed to help water and wastewater utility managers make practical, systematic changes to achieve excellence in utility performance. It was produced by water and wastewater utility leaders who are committed to helping utility managers improve water and wastewater management. The Primer distills the expertise and experience of these utility leaders into a framework intended to help a utility manager identify and address their most pressing needs through a customized, incremental approach that is relevant to the day-to-day challenges utilities face.

Rather than focusing on just financial or operational goals, this Primer considers all significant aspects of water and wastewater utility management. The Primer has three primary components:

- *The Ten Attributes of Effectively Managed Water Sector Utilities (Attributes).* These Attributes provide a clear set of reference points and are intended to help utilities maintain a balanced focus on all important operational areas rather than quickly moving from one problem to the next (Section II).
- *Keys to Management Success.* These proven approaches help utilities maximize their resources and improve performance (Section III).
- *Where to Begin—A Self-Assessment Tool.* A utility-tailored self assessment tool helps utility managers identify where to begin improvement efforts. By assessing how a utility performs relative to the Attributes, utility managers can gain a more balanced and comprehensive picture of their organization (Section IV).

Effective utility management is applicable to all utilities, regardless of size or circumstance

In addition, the Primer provides a set of sample measures to help utility managers gauge performance and assess improvement progress (Section V). It also provides links to a web-based "resource toolbox" which offers additional information and guidance on effective utility management (Section VI).

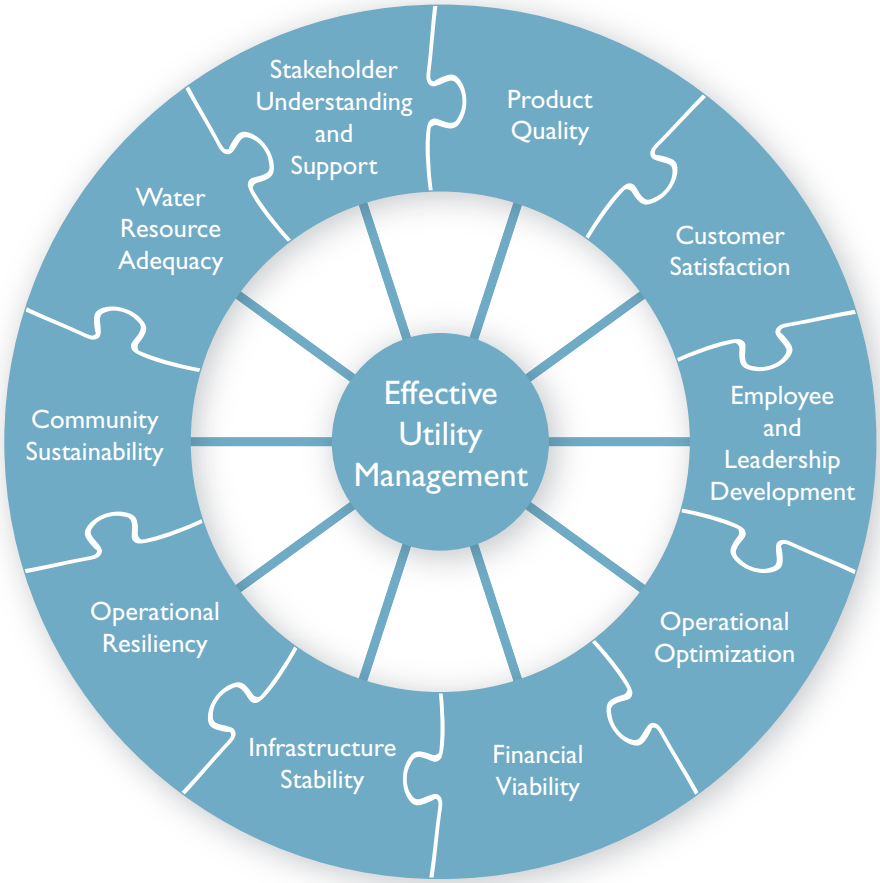
Utility managers and stakeholders can use this Primer in a variety of ways. At one end of the spectrum, the Primer can educate utility staff and stakeholders regarding the range of responsibilities faced by water and wastewater managers. At the other end of the spectrum, it can provide a framework for a utility's long-term strategic planning efforts. Regardless of where a utility is in the spectrum, this Primer can help integrate the Attributes of effective utility management with existing strategic, business, and/or asset management plans.

All water and wastewater utilities can benefit from applying this Primer. Each utility has unique management opportunities and challenges, and this Primer provides guidelines and tools that are relevant to any utility, regardless of size, budget, or circumstance. This Primer's aim is to support all water and wastewater utilities in their common mission of being successful 21st century service providers.

II. Ten Attributes of Effectively Managed Water Sector Utilities

The Ten Attributes of Effectively Managed Water Sector Utilities provide useful and concise reference points for utility managers seeking to improve organization-wide performance. The Attributes describe desired outcomes that are applicable to all water and wastewater utilities. They comprise a comprehensive framework related to operations, infrastructure, customer satisfaction, community welfare, natural resource stewardship, and financial performance.

Water and wastewater utilities can use the Attributes to select priorities for improvement, based on each organization's strategic objectives and the needs of the community it serves. The Attributes are not presented in a particular order, but rather can be viewed as a set of opportunities for improving utility management and operations. Section IV (Where to Begin), provides a basic self-assessment tool to help utilities easily identify needs and opportunities. However, utilities will be able to deliver increasingly efficient, high-quality service by addressing more, and eventually all, of the Attributes. Section V provides several sample performance measures for each of the Attributes.



Ten Attributes of Effectively Managed Water Sector Utilities

Ten Attributes of Effectively Managed Water Sector Utilities

Product Quality
Produces potable water, treated effluent, and process residuals in full compliance with regulatory and reliability requirements and consistent with customer, public health, and ecological needs.

Customer Satisfaction
Provides reliable, responsive, and affordable services in line with explicit, customer-accepted service levels. Receives timely customer feedback to maintain responsiveness to customer needs and emergencies.

Employee and Leadership Development
Recruits and retains a workforce that is competent, motivated, adaptive, and safe-working. Establishes a participatory, collaborative organization dedicated to continual learning and improvement. Ensures employee institutional knowledge is retained and improved upon over time. Provides a focus on and emphasizes opportunities for professional and leadership development and strives to create an integrated and well-coordinated senior leadership team.

Operational Optimization
Ensures ongoing, timely, cost-effective, reliable, and sustainable performance improvements in all facets of its operations. Minimizes resource use, loss, and impacts from day-to-day operations. Maintains awareness of information and operational technology developments to anticipate and support timely adoption of improvements.

Financial Viability
Understands the full life-cycle cost of the utility and establishes and maintains an effective balance between long-term debt, asset values, operations and maintenance expenditures, and operating revenues. Establishes predictable rates—consistent with community expectations and acceptability—adequate to recover costs, provide for reserves, maintain support from bond rating agencies, and plan and invest for future needs.

Infrastructure Stability
Understands the condition of and costs associated with critical infrastructure assets. Maintains and enhances the condition of all assets over the long-term at the lowest possible life-cycle cost and acceptable risk consistent with customer, community, and regulator-supported service levels, and consistent with anticipated growth and system reliability goals. Assures asset repair, rehabilitation, and replacement efforts are coordinated within the community to minimize disruptions and other negative consequences.

Operational Resiliency
Ensures utility leadership and staff work together to anticipate and avoid problems. Proactively identifies, assesses, establishes tolerance levels for, and effectively manages a full range of business risks (including legal, regulatory, financial, environmental, safety, security, and natural disaster-related) in a proactive way consistent with industry trends and system reliability goals.

Community Sustainability
Is explicitly cognizant of and attentive to the impacts its decisions have on current and long-term future community and watershed health and welfare. Manages operations, infrastructure, and investments to protect, restore, and enhance the natural environment; efficiently uses water and energy resources; promotes economic vitality; and engenders overall community improvement. Explicitly considers a variety of pollution prevention, watershed, and source water protection approaches as part of an overall strategy to maintain and enhance ecological and community sustainability.

Water Resource Adequacy
Ensures water availability consistent with current and future customer needs through long-term resource supply and demand analysis, conservation, and public education. Explicitly considers its role in water availability and manages operations to provide for long-term aquifer and surface water sustainability and replenishment.

Stakeholder Understanding and Support
Engenders understanding and support from oversight bodies, community and watershed interests, and regulatory bodies for service levels, rate structures, operating budgets, capital improvement programs, and risk management decisions. Actively involves stakeholders in the decisions that will affect them.

III. Keys to Management Success

The Keys to Management Success are comprised of frequently used management approaches and systems that experience indicates help water and wastewater utilities manage more effectively. They create a supportive climate for a utility as it works towards the outcomes outlined in the Attributes, and they can help integrate the utility's improvement efforts across the Attributes. The Keys to Management Success are listed below.

Effective leadership produces organizational alignment and clear direction

1. Leadership

Leadership is critical to effective utility management, particularly in the context of driving and inspiring change within an organization. "Leadership" refers both to individuals who can be effective champions for improvement, and to teams that provide resilient, day-to-day management continuity and direction. Effective leadership ensures that the utility's direction is understood, embraced, and followed on an ongoing basis throughout the management cycle. Leadership has an important responsibility to communicate with the utility's stakeholders and customers. It further reflects a commitment to organizational excellence, leading by example to establish and reinforce an organizational culture that embraces positive change and strives for continual improvement. Organizational improvement efforts require commitment from the utility's leadership.

2. Strategic Business Planning

Strategic business planning is an important tool for achieving balance and cohesion across the Attributes. A strategic plan provides a framework for decision making by:

- Assessing current conditions, strengths and weaknesses;
- Assessing underlying causes and effects; and
- Establishing vision, objectives, and strategies.

It establishes specific implementation steps that will move a utility from its current level of performance to achieving its vision.

Preparation of a strategic business plan involves taking a long-term view of utility goals and operations and establishing a clear vision and mission. When developed, the strategic business plan will drive and guide utility objectives, measurement efforts, investments, and operations. A strategic plan can help explain the utility's conditions, goals, and plans to staff and stakeholders, stimulate change, and increase engagement in improvement efforts.

After developing a strategic business plan, it is important that the utility integrates tracking of progress into its management framework.

3. Organizational Approaches

There are a variety of organizational approaches that contribute to overall effective utility management and that are critical to the success of management improvement efforts. These include:

- Actively engaging employees in improvement efforts (helping to identify improvement opportunities, participating in cross-functional improvement teams, etc.);
- Deploying an explicit change management process that anticipates and plans for change and encourages staff at all levels to embrace change; and
- Utilizing implementation strategies that seek, identify, and celebrate early, step-by-step victories.

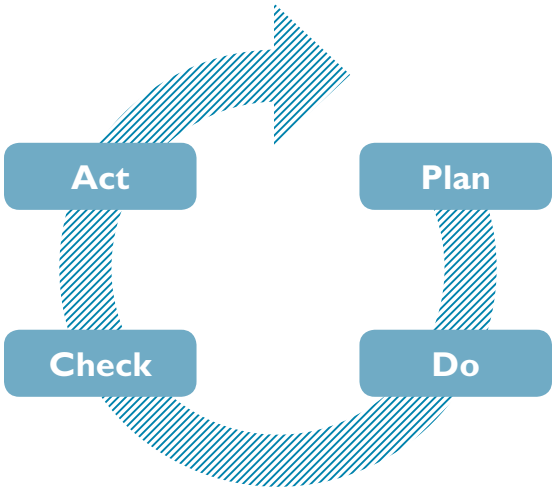
4. Measurement

Measurement is critical to management improvement efforts associated with the Attributes and is the backbone of successful continual improvement management and strategic business planning. A measurement system serves many vital purposes, including focusing attention on key issues, clarifying expectations, facilitating decision making, and, most importantly, learning and improving. As one utility manager put it, "You can't improve what you don't measure." Successful measurement efforts often are:

"You can't improve what you don't measure."

- Viewed as a continuum starting with basic internal tracking, and, as needed and appropriate, moving to more sophisticated baselining and trend analysis, development of key performance indicators, and inclusion of externally oriented measures which address community sustainability interests;
- Driven by and focused on answering questions critical to effective internal management and external stakeholder needs (e.g., information needed to allow governing bodies to comfortably support large capital investments); and
- Supported by a well-defined decision framework assuring results are evaluated, communicated, and responded to in a timely manner.

Deciding where to start and what to measure can be challenging. Measures can also be taken out of context. Therefore, while an essential tool in the self-improvement process, measurement is not the only tool and should be approached, structured, and used thoughtfully. Section V includes sample performance measures that can be used in conjunction with utility-specific baselines and targets.



5. Continual Improvement Management Framework

A continual improvement management framework is usually implemented through a complete, start-to-finish management system, frequently referred to as a "Plan-Do-Check-Act" framework. This framework plays a central role in effective utility management and is critical to making progress on the Attributes. Continual improvement management includes:

- Conducting an honest and comprehensive self-assessment to identify management strengths, areas for improvement, priority needs, etc.;
- Conducting frequent sessions among interested parties to identify improvement opportunities;
- Following up on improvement projects underway;
- Establishing and implementing performance measures and specific internal targets associated with those measures;
- Defining and implementing related operational requirements, practices, and procedures;
- Establishing supporting roles and responsibilities;
- Implementing measurement activities such as regular evaluation through operational and procedural audits; and
- Responding to evaluations through the use of an explicit change management process.

This "Plan-Do-Check-Act" continual improvement framework is quite effective when applied internally. It can also be enhanced by using gap analysis, establishment of standard operating procedures, internal trend analysis and external benchmarking, best practice review, and other continual improvement tools. The framework can help utilities understand improvement opportunities and establish explicit service levels, guide investment and operational decisions, form the basis for ongoing measurement, and provide the ability to communicate clearly with customers and key stakeholders.

The Resource Toolbox described in Section VI, Utility Management Resources, provides links to resources that support utilization of the Keys to Management Success.

IV. Where to Begin

Step 1
Candidly Assess Current Conditions

Step 2
Rank Importance of Each Attribute to Your Utility

Step 3
Graph Attributes to Determine Importance and Level of Achievement

Step 4
Choose Attributes

Step 5
Develop and Implement an Improvement Plan

There are many ways to improve utility performance and each utility is unique. Many utilities may choose to start small and make improvements step by step, perhaps by working on projects that will yield early successes. Other utilities may choose to take on several ambitious change efforts simultaneously. Some may prefer to enhance their strengths, while others will prefer to focus on addressing weaknesses. Each utility should determine for itself the most important issue to address, based on its own strategic objectives, priorities, and the needs of the community it serves.

A candid assessment of current performance is often a useful first step in identifying options for improvement. It also establishes a quantifiable baseline from which to measure progress. As conditions change, future reassessments will reveal new opportunities and new priorities.

The following self assessment tool can help water and wastewater managers evaluate their utility's current performance against internal goals or specific needs and determine where to focus improvement efforts. It can be completed by an individual manager, but would also be useful as a vehicle for conversation and consensus building among the utility's management team and other appropriate stakeholders, such as oversight bodies, community and watershed interests, and regulatory authorities.

The assessment tool has five steps: 1) Assess current conditions; 2) Rank the importance of each Attribute for your utility; 3) Chart the results; 4) Choose one or more Attributes to focus on; and 5) Develop and implement an improvement plan.

The Self Assessment can also be found in Appendix B.

Step 1: Assess Current Conditions

On a 1-to-5 scale, assess current conditions by rating your utility's systems and approaches and current level of achievement for each Attribute. Consider the degree to which your current management systems effectively support each of the Attributes and their component parts. Consider all components of each Attribute and gauge your rating accordingly. Use these descriptions to guide your rating.

Rating	Description
1.	Effective, systematic approach and implementation; consistently achieve goals.
2.	Workable systems in place; mostly achieve goals.
3.	Partial systems in place with moderate achievement, but could improve.
4.	Occasionally address this when specific need arises.
5.	No system for addressing this.

Step 2: Rank Importance of Attributes

Rank the importance of each Attribute to your utility, based on your utility's vision, goals, and specific needs. The ranking should reflect the interests and considerations of all stakeholders (managers, staff, customers, regulators, elected officials, community and watershed interests, shareholders, and others).

There are ten Attributes; considering long-term importance to your utility, rank the most important Attribute 1, the second most important 2, and so on. The least important Attribute would be ranked 10. Your ranking of each Attribute's importance might be influenced by current or expected challenges in that particular area, recent accomplishments in addressing these issues, or other factors. Importance ranking is likely to change over time as internal and external conditions change.

As you fill in numbers on the table below, please note that your analysis for Step 1 (rating achievement) should be separate and independent from your analysis for Step 2 (ranking importance).

Attribute	Attribute Components	**Step 1**: Rate Achievement (1-5)	**Step 2:** Rank Importance (1-10)
Product Quality (PQ)	○ Complies with regulatory and reliability requirements. ○ Consistent with customer, public health, and ecological needs.		
Customer Satisfaction (CS)	○ Provides reliable, responsive, and affordable services. ○ Receives timely customer feedback. ○ Responsive to customer needs and emergencies.		

Rating and Ranking Table, *continued*

Attribute	Attribute Components	**Step 1**: Rate Achievement (1-5)	**Step 2:** Rank Importance (1-10)
Employee and Leadership Development (ED)	○ Recruits and retains competent workforce. ○ Collaborative organization dedicated to continual learning and improvement. ○ Employee institutional knowledge retained and improved. ○ Opportunities for professional and leadership development. ○ Integrated and well-coordinated senior leadership team.		
Operational Optimization (OO)	○ Ongoing performance improvements. ○ Minimizes resource use and loss from day-to-day operations. ○ Awareness and timely adoption of operational and technology improvements.		
Financial Viability (FV)	○ Understands full life-cycle cost of utility. ○ Effective balance between long-term debt, asset values, operations and maintenance expenditures, and operating revenues. ○ Predictable and adequate rates.		
Infrastructure Stability (IS)	○ Understands the condition of and costs associated with critical infrastructure assets. ○ Maintains and enhances assets over the long-term at the lowest possible life-cycle cost and acceptable risk. ○ Repair efforts are coordinated within the community to minimize disruptions.		
Operational Resiliency (OR)	○ Staff work together to anticipate and avoid problems. ○ Proactively establishes tolerance levels and effectively manages risks (including legal, regulatory, financial, environmental, safety, security, and natural disaster-related).		

Rating and Ranking Table, *continued*

Attribute	Attribute Components	**Step 1**: Rate Achievement (1-5)	**Step 2:** Rank Importance (1-10)
Community Sustainability (SU)	○ Attentive to impacts on community and watershed health and welfare. ○ Operations enhance natural environment. ○ Efficiently use water and energy resources; promote economic vitality; and engender overall community improvement. ○ Maintain and enhance ecological and community sustainability including pollution prevention, watershed, and source water protection.		
Water Resource Adequacy (WA)	○ Ensures water availability through long-term resource supply and demand analysis, conservation, and public education. ○ Manages operations to provide for long-term aquifer and surface water sustainability and replenishment.		
Stakeholder Understanding and Support (SS)	○ Engenders understanding and support from oversight bodies, community and watershed interests, and regulatory bodies for service levels, rate structures, operating budgets, capital improvement programs, and risk management decisions. ○ Actively involves stakeholders in the decisions that will affect them.		

Step 3: Graph Results

Graph each Attribute based on your rating and ranking. For example, if you rated Product Quality (PQ) 4 for achievement and ranked it 3 for importance, you would place it on the graph as illustrated below. Similarly, if you rated Customer Satisfaction (CS) 3 for achievement and ranked it 5 for importance, you would place it on the graph as illustrated below. A blank graph is provided in Appendix B.

Rating											
	Lower Achievement	5										
		4			PQ							
		3					CS					
	Higher Achievement	2										
		1										
			1	2	3	4	5	6	7	8	9	10
			More Important						Less Important			
			Ranking									

Step 4: Choose Attributes

The goal of effective utility management is to establish high-achieving systems and approaches for each Attribute. Ultimately, utilities should strive to improve performance for all Attributes until each can be charted in the lower half of the table (high achieving). Utility managers may wish to focus on one or a few Attributes at a time, aiming to eventually ensure that all Attributes have been addressed and improved upon over time.

Examining the results of the charting exercise in Step 3 can help identify Attributes to focus on. Attributes that graph into the *blue quadrant* are both very important (ranked 1-5), and under-developed (rated 3-5). These Attributes are strong candidates for improvement efforts. Attributes that fall in the lower left-hand quadrant are both important and well-developed. Some utilities may choose to focus on these areas to continue further improving upon important and well-developed areas, due to their long-term importance (for example, water resource adequacy). Specifically examining these areas may also help a utility identify success factors which would be helpful in addressing areas need-

ing improvement. Others may choose to focus on Attributes that would lead to early successes to build confidence in effecting change, Attributes that maximize benefit relative to the utility's key goals, or Attributes that minimize risks (e.g., fines, penalties, lawsuits, poor public perception).

The choice to embark on improvements in one or more areas is up to the judgment of utility managers, and may also involve consideration of resources (staff and financial), leadership support, and other competing activities. Applying strategic business planning, measurement, and other Keys to Management Success is very important for moving each Attribute over time to the "well-developed" quadrants.

Step 5: Develop and Implement an Improvement Plan

Once you choose to improve one or more Attributes, the next step is to develop and implement a plan for making the desired improvements. Effective improvement plans commonly include the following features:

- A "gap" analysis to identify root causes of under-performance. This analysis would describe the utility's performance goals, its current position relative to its goals, and the reasons for not achieving its goals;
- Development of a utility-specific plan and/or strategy to achieve performance goals and address the root causes. The plan should consider how to incorporate customer and, as appropriate, broader stakeholder interests;
- Specific tasks, tactics, or management adjustments necessary to implement the utility's strategy;
- Utility-specific measures to track progress toward achievement of performance goals; and
- A timeframe for follow-up measurement to assess the degree of accomplishment and potential need for additional effort.

Utilities may also find it useful to appoint an overall improvement program manager to oversee individual improvement projects.

The improvement plan should be developed and implemented within the context of strategic business planning, the "Plan-Do-Check-Act" continual improvement framework, and other components of the Keys to Management Success discussed in Section III.

V. Utility Measures

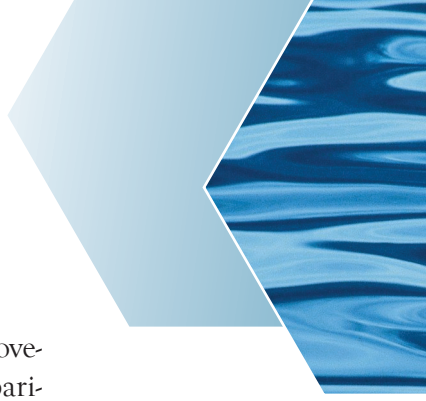
Measuring performance is one of the keys to utility management success. This section of the Primer provides ideas about how to approach measurement and then offers measures for each Attribute to help understand a utility's status and progress.

Approaching Measurement

There are two general approaches to performance measurement. Internal performance measurement, which is the focus of this Primer, involves evaluating current internal utility performance status and trends. It can also include comparison of outcomes or outputs relative to goals, objectives, baseline status, targets, and standards. Benchmarking—*which is not this Primer's focus*—is the overt comparison of similar measures or processes across organizations to identify best practices, set improvement targets, and measure progress within or sometimes across sectors. A utility may decide to engage in benchmarking for its own internal purposes or in a coordinated fashion with others.

While performance measures should be tailored to the specific needs of your utility, the following guidelines can help you identify useful measures and apply them effectively.

1. Select measures that support the organization's strategic objectives, mission, and vision, as well as the ten Attributes.
2. Select the right number, level, and type of measures for your organization. Consider how measures can be integrated as a cohesive group (e.g., start with a small set of measures across broad categories and increase number and specificity over time as needed), and consider measures that can be used by different audiences within the organization.
3. Measuring performance will not necessarily require additional staff, but will require resources. Allocate adequate resources to get the effort off to a good start, and fine tune over time to balance the level of measurement effort with the benefit to the organization.
4. Develop clear, consistent definitions for each measure. Identify who is responsible for collecting the data, and how the data will be tracked and reported.
5. Engage the organization at all levels in developing, tracking, and reporting measures, but also assign someone in the organization the role of championing and coordinating the effort.



6. Set targets rationally, based on criteria such as customer expectations, improvement over previous years, industry performance, or other appropriate comparisons. Tie targets to improving performance in the Attributes.
7. Select and use measures in a positive way to improve decision making, clarify expectations, and focus attention, not just to monitor, report, and control.
8. When selecting measures, consider how they relate to one another. Look for cause-and-effect relationships; for example, how improvements in product quality could result in increased customer satisfaction.
9. Develop an effective process to evaluate and respond to results. Identify how, when, and to whom you will communicate results.
10. Incorporate the "Plan-Do-Check-Act" cycle approach into evaluating both the specific measures and the system as a whole. Regularly review the performance measurement system for opportunities to improve.

... and remember to celebrate your measured and documented successes!

Attribute-Related Measures

The list below provides a limited list of targeted, Attribute-related measures. Taken as a whole, the measures provide a utility with a cohesive, approachable, and generally applicable starting place for gauging progress relative to the Ten Attributes. The list, for brevity, contains measure "headlines" for each Attribute; Appendix C provides further explanation and, where applicable, example calculations.

You can choose and tailor the measures to your own needs and unique, local circumstances. They are intended for your own internal use, even as certain measures (e.g., those noted as QualServe Indicators) can support benchmarking purposes. In these cases, the measures have been selected because they are relevant to the Attributes, have been tested and are in use by utilities, are supported by reference information useful for implementation, and generally can act as a good starting point for Attribute-related progress assessment.

As described in Appendix C, the measures are both quantitative and qualitative. Most are quantitative and include generally applicable example calculations. The qualitative "measures" encourage active assessment of the management area and most have a "yes/no" format.

Like the Attributes themselves, certain measures focus on core utility operations. Several measures reflect emerging utility issues, challenges, or opportunities that have

received increasing attention from a growing number of utility managers. Other measures may reflect broader interests that are worthy of consideration from a broader community perspective.

List of Attribute-Related Utility Measures

See Appendix C for measure descriptions and details.

Product Quality

1. Product quality regulatory compliance
2. Product quality service delivery

Customer Satisfaction

1. Customer complaints
2. Customer service delivery
3. Customer satisfaction

Employee and Leadership Development

1. Employee retention and satisfaction
2. Management of core competencies
3. Workforce succession preparedness

Operational Optimization

1. Resource optimization
2. Water management efficiency

Financial Viability

1. Budget management effectiveness
2. Financial procedure integrity
3. Bond ratings
4. Rate adequacy

Infrastructure Stability

1. Asset inventory
2. Asset (system) renewal/replacement
3. Water distribution/collection system integrity
4. Planned maintenance

Operational Resiliency

1. Recordable incidents of injury or illnesses
2. Insurance claims
3. Risk assessment and response preparedness
4. Ongoing operational resiliency
5. Operational resiliency under emergency conditions

Community Sustainability

1. Watershed-based infrastructure planning
2. Green infrastructure
3. Greenhouse gas emissions
4. Service affordability

Water Resource Adequacy

1. Water supply adequacy
2. Supply and demand management

Stakeholder Understanding and Support

1. Stakeholder consultation
2. Stakeholder satisfaction
3. Internal benefits from stakeholder input
4. Comparative rate rank
5. Media/press coverage

VI. Utility Management Resources

As a companion resource to this Primer, the Collaborating Organizations developed an online Resource Toolbox which offers additional information and guidance on effective utility management. The Toolbox provides a compilation of resources from the seven Collaborating Organizations designed to help the water and wastewater utility community further improve the management of its infrastructure.

The Resource Toolbox is organized according to the Ten Attributes of Effectively Managed Water Sector Utilities and five Keys to Management Success, providing a set of resources relevant to each Attribute and Key. The Toolbox also includes information on where to find these resources.

The Resource Toolbox is located at the website for the Effective Utility Management initiative, at www.watereum.org.

VII. For More Information

This Primer was developed through a collaborative partnership with the following groups. More information about this partnership can be found on their websites or by contacting specific individuals directly.

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VIII. Appendix A: Definitions

The following terms are presented in this Primer. These definitions provide a brief overview of their meaning.

- **Attribute**: A characteristic or outcome of a utility that indicates effective performance.
- **Benchmarking**: The comparison of similar processes or measures across organizations and/or sectors to identify best practices, set improvement targets, and measure progress.
- **Effective Utility Management**: Management that improves products and services, increases community support, and ensures a strong and viable utility into the future.
- **Gap analysis**: Defining the present state of an enterprise's operations, the desired or "target" state, and the gap between them.
- **Internal trend analysis**: Comparison of outcomes or outputs relative to goals, objectives, baselines, targets, and standards.
- **Life-cycle cost**: The total of all internal and external costs associated with a product, process, or activity throughout its entire life cycle – from raw materials acquisition to manufacture/construction/installation, operation and maintenance, recycling, and final disposal.
- **Performance measurement**: Evaluation of current status and trends; can also include comparison of outcomes or outputs relative to goals, objectives, baselines, targets, standards, other organizations' performance or processes (typically called benchmarking), etc.
- **Operations and maintenance expenditure**: Expenses used for day-to-day operation and maintenance of a facility.
- **Operating revenue**: Revenue realized from the day-to-day operations of a utility.
- **Performance measure**: A particular value or characteristic designated to measure input, output, outcome, efficiency, or effectiveness.
- **Source water protection**: Efforts to prevent water quality degradation in streams, rivers, lakes, or underground aquifers used as public drinking water supplies.
- **Standard operating procedure**: A prescribed procedure to be followed routinely; a set of instructions having the force of a directive, covering those features of operations that lend themselves to a definite or standardized procedure without loss of effectiveness.

- **Strategic plan**: An organization's process of defining its goals and strategy for achieving those goals. Often entails identifying an organization's vision, goals, objectives, and targets over a multi-year period of time, as well as setting priorities and making decisions on allocating resources, including capital and people, to pursue the identified strategy.
- **Stewardship**: The careful and responsible management of something entrusted to a designated person or entity's care; the responsibility to properly utilize its resources, including its people, property, and financial and natural assets.
- **Sustainability**: The use of natural, community, and utility resources in a manner that satisfies current needs without compromising future needs or options.
- **Watershed health**: The ability of ecosystems to provide the functions needed by plants, wildlife, and humans, including the quality and quantity of land and aquatic resources.

IX. Appendix B: Self Assessment

Step 1: Assess Current Conditions

On a 1-to-5 scale, assess current conditions by rating your utility's systems and approaches and current level of achievement for each Attribute. Consider the degree to which your current management systems effectively support each of the Attributes and their component parts. Consider all components of each Attribute and gauge your rating accordingly. Use these descriptions to guide your rating.

Rating	Description
1.	Effective, systematic approach and implementation; consistently achieve goals.
2.	Workable systems in place; mostly achieve goals.
3.	Partial systems in place with moderate achievement, but could improve.
4.	Occasionally address this when specific need arises.
5.	No system for addressing this.

Mark your answers in the Step 1 column of the table on the next page.

Step 2: Rank Importance of Attributes

Rank the importance of each Attribute to your utility, based on your utility's vision, goals, and specific needs. The ranking should reflect the interests and considerations of all stakeholders (managers, staff, customers, regulators, elected officials, community and watershed interests, shareholders, and others).

There are ten Attributes; considering long-term importance to your utility, rank the most important Attribute 1, the second most important 2, and so on. The least important Attribute would be ranked 10. Your ranking of each Attribute's importance might be influenced by current or foreseeable challenges in that particular area, recent accomplishments in addressing these issues, or other factors. Importance ranking is likely to change over time as internal and external conditions change.

Mark your answers in the Step 2 column of the table on the next page. As you fill in numbers, please note that your analysis for Step 1 (rating achievement) should be separate and independent from your analysis for Step 2 (ranking importance).

Attribute	**Step 1:** Rate Achievement (1-5)	**Step 2:** Rank Importance (1-10)
Product Quality (PQ)		
Customer Satisfaction (CS)		
Employee and Leadership Development (ED)		
Operational Optimization (OO)		
Financial Viability (FV)		
Infrastructure Stability (IS)		
Operational Resiliency (OR)		
Community Sustainability (SU)		
Water Resource Adequacy (WA)		
Stakeholder Understanding and Support (SS)		

Step 3: Graph Results

Graph each Attribute based on your rating and ranking.

Rating											
Lower Achievement	5										
	4			PQ							
	3					CS					
Higher Achievement	2										
	1										
		1	2	3	4	5	6	7	8	9	10
		More Important						Less Important			
		Ranking									

X. Appendix C: Attribute-Related Water Utility Measures

This Appendix provides more detailed information on the measures offered in Section V of the Primer, including descriptions and example calculations and questions.

Product Quality

1. Product quality regulatory compliance

Description: Water product quality compliance, particularly with regards to 40 CFR Part 141 (the National Primary Drinking Water Regulations), the National Pollutant Discharge Elimination System, and any other relevant federal (Clean Water Act, Safe Drinking Water Act, etc.) or state statute/regulations and permit requirements. The scope can include the quality of all related products, including drinking water, fire suppression water, treated effluent, reused water, and biosolids, as well as quality-related operating requirements such as pressure and number of sewer overflows.

Example calculations:

- *Drinking water compliance rate* (percent): 100 X (number of days in full compliance for the year ÷ 365 days). This is a QualServe Indicator.[1]
- *Wastewater treatment effectiveness rate* (percent): 100 X (365 – total number of standard noncompliance days ÷ 365 days). This is a QualServe Indicator.[2]
- *Number, type, and frequency of "near (compliance) misses"*: For example, reaching 80-95% of allowable levels of "X" during reporting period, typically per month. Tracking this type of measure could be used to improve performance in these "near miss" areas before violations occur.

2. Product quality service delivery

Description: This measure assesses delivery of product quality service based on utility-established objectives and service level targets. It focuses on non-regulatory performance targets.

[1] This is one of the 22 Performance Indicators from the Qualserve program, a voluntary quality improvement program designed for water and wastewater utilities by the American Water Works Association and the Water Environment Federation. Reference from the American Water Works Association and the Awwa Research Foundation, *Selection and Definition of Performance Indicators for Water and Wastewater Utilities*, p. 57. 2004. Note: This material is copyrighted and any reprinting must be by permission of the American Water Works Association.

[2] Ibid., p. 71. 2004.

Example calculations:

- *Drinking water flow and pressure* (percent): 100 X [number of customers with less than (flow of "X" gallons per minute (gpm) and pressure of "Y" pounds per square inch (psi)—levels set by utility) ÷ total number of customers] (during reporting period, typically per month).
- *Fire suppression water flow and pressure* (percent): 100 X [hours of time when (flow of "X" gpm and pressure of "Y" psi—levels set by utility) is available for fire suppression at maximum day demand ÷ total number of hours when fire suppression water should be available at maximum day demand] (during reporting period, typically per month).
- *Service interruptions* (percent): 100 X (number of active account customers experiencing a service interruption of greater than 1 hour ÷ total number of customers during reporting period) (typically per month). Note: the utility may elect to measure planned and unplanned interruptions separately.
- *Water quality goals met/not met*: Number of days in reporting period (typically one month) where utility-defined beyond-compliance targets are met/not met.
- *Sewer backups* (if not included in permit requirements) (amount and percent): Number of customers experiencing backups each year; 100 X (number of customers experiencing backups each year ÷ total number of customers).
- *Sewer overflows* (if not included in permit requirements): Number of sewer overflows per 100 miles of collection system piping.
- *Water reuse* (amount and percent):
  - Amount: Amount of water supplied that is from reused/recycled sources.
  - Percent: 100 X (amount of water supplied that is from reused/recycled water ÷ total amount of water supplied).

  Then, as desired, these amounts can be broken into recipients/applications (e.g., irrigation, agriculture, industrial processes, etc.).
- *Biosolids put to beneficial use* (percent): 100 X (amount of biosolids produced that are put to a beneficial use ÷ total amount of biosolids produced) (in wet tons per year).

Customer Satisfaction

1. Customer complaints

Description: This measure assesses the complaint rates experienced by the utility, with individual quantification of customer service and core utility service complaints.[3] As a "passive measure," it will not likely be numerically representative (i.e., a statistically valid customer sample group) and is a "starting point" measure for understanding customer service problems.

Example calculations:

- Number of complaints per 1,000 customers per reporting period, recorded as either customer service or technical quality complaints. These calculations are based on the QualServe Customer Service Complaints/Technical Quality Complaints Indicator.
  - *Customer service complaint rate*: 1,000 X (customer service associated complaints ÷ number of active customer accounts). This is a QualServe Indicator.[4]
  - *Technical quality complaint rate*: 1,000 X (technical quality associated complaints ÷ number of active customer accounts). This is a QualServe Indicator.[5]

For both calculations, utilities may wish to subcategorize complaints by type and aspect (e.g., customer service into billing, problem responsiveness, interruptions, etc., and technical quality into service deficiencies such as taste, odor, appearance, flow/pressure, etc.) and by type of customer (e.g., residential, industrial, commercial, etc.)

2. Customer service delivery

Description: This measure requires the utility, based on internal objectives and customer input, to set desirable customer service levels, then determine an appropriate (target) percentage of time to meet the performance levels. Once established, the utility can track how often it meets the service levels, helping the utility to determine how well customer needs are being satisfied (e.g., have 95 percent of service calls received a response within 60 minutes). A utility can average across individual measures to determine the overall percentage of service level commitments met.

[3] From AWWA and AwwaRF, *Selection and Definition of Performance Indicators for Water and Wastewater Utilities*, p. 41. 2004. Note: This material is copyrighted and any reprinting must be by permission of the American Water Works Association
[4] Ibid., p. 41.
[5] Ibid., p. 42.

Example calculations:

- *Call responsiveness* (percent): 100 X (number of calls responded to within "X" minutes ÷ total number of calls during reporting period) (typically per month).
- *Error-driven billing adjustment rate* (percent): 100 X (number of error-driven billing adjustments during reporting period ÷ number of bills generated during reporting period). This is a QualServe Indicator.[6]
- *Service start/stop responsiveness* (percent): 100 X (number of stop/start service orders processed within "X" days ÷ total number of stop/start service orders during reporting period).
- *First call resolution* (percent): 100 X (number of calls for which problem was resolved/fixed/scheduled to be fixed at the time of the first call ÷ total number of calls during reporting period).

3. Customer satisfaction

Description: This is an overarching customer satisfaction measure based on requested customer feedback (surveys), not calls received or internal customer satisfaction service level commitments. A utility can measure customer satisfaction immediately after service provision or use a periodically performed, more comprehensive customer satisfaction survey. After-service surveys are simpler and easier for the utility to develop and implement without professional advice, but they tend to over represent the most satisfied (e.g., those who just received service) and the most dissatisfied (e.g., those who just called with complaints) customers. Comprehensive surveys can provide statistical validity enabling extrapolation to the population served. A utility can verify survey information through customer conversations, either as follow up to a survey, during public meetings or focus groups, or by some other method (e.g., individual telephone calls).

Example calculation:

- *Overall customer satisfaction*: Percent of positive or negative customer satisfaction survey responses based on a statistically valid survey or on an immediately after-service survey. Satisfaction responses can be divided into categories such as: highly satisfied/satisfied/moderately satisfied/unsatisfactory; exceeding expectations/meeting expectations/not meeting expectations; numerical scales (e.g., 1-5); or other divisions. Customer satisfaction information is often also gathered and assessed by topic areas such as product quality, service reliability, billing accuracy, customer service, costs/rates/value, crew courtesy, notification around street construction/service interruptions, etc.

[6] From AWWA and AwwaRF, *Selection and Definition of Performance Indicators for Water and Wastewater Utilities*, p. 49. 2004. Note: This material is copyrighted and any reprinting must be by permission of the American Water Works Association.

Employee and Leadership Development

1. Employee retention and satisfaction

Description: This measure gauges a utility's progress toward developing and maintaining a competent and stable workforce, including utility leadership.

Example calculations:

- *Employee turnover rate* (percent): 100 X (number of employee departures ÷ total number of authorized positions per year). Can be divided into categories such as:
  - *Voluntary turnover* (percent): 100 X (number of voluntary departures ÷ total number of authorized positions per year). (Perhaps the best indicator of retention problems.)
  - *Retirement turnover* (percent): 100 X (number of retirement departures ÷ authorized positions per year). (Measures loss/retention of institutional knowledge.)
  - *Experience turnover* (percent): 100 X (number of years of experience represented by all departures ÷ total years of experience with the organization) (at the beginning of the year). (These are harder data to collect but provide a good assessment of institutional knowledge loss potential and therefore the need to retain/capture institutional knowledge.)
- *Employee job satisfaction* (percent): 100 X (number of employees with "X" job satisfaction level ÷ total number of employees) (based on implementation and monitoring over time of a comprehensive employee survey). Can be divided into work type or job classification categories, etc., and cover overall satisfaction and topics deemed relevant to longer-term employee satisfaction and retention, such as:
  - Compensation and benefits
  - Management
  - Professional development and long-term advancement opportunities
  - Work and teamwork
  - Procedures
  - Fairness and respect
  - Communication

2. Management of core competencies

Description: This measure assesses the utility's investment in and progress toward strengthening and maintaining employee core competencies.

Example calculations and assessment areas:

- *Presence of job descriptions and performance expectations*: Does your organization have and maintain current job descriptions and related performance expectations (yes/no)?
- *Training hours per employee*: Total of qualified formal training hours for all employees ÷ total FTEs worked by employees during the reporting period. This is a QualServe Indicator.[7]
- *Certification coverage* (percent): 100 X (number of certifications achieved or maintained ÷ number of needed certifications per year) (across the utility).
- *Employee evaluation results* (assumes utility evaluates employee performance in a routine way and documents results): Results of employee evaluations (e.g., employee growth not clearly demonstrated, employee growth only demonstrated in certain areas or for certain labor categories, etc.).
- *Presence of employee-focused objectives and targets*: Do you have employee-focused organizational objectives and targets and a related professional management system in place? Are you meeting your targets (yes/no)? (Targets could be, for instance, related to quantity, quality, timeliness, or cost. A timeliness target could, for example, relate to the number of hours it takes on average to complete a routine task.)

3. Workforce succession preparedness

Description: This measure assesses utility long-term workforce succession planning efforts to ensure critical skills and knowledge are retained and enhanced over time, particularly in light of anticipated retirement volume in coming years. Focus is on preparing entire groups or cohorts for needed workforce succession, including continued training and leadership development.

Example calculations:

- *Key position vacancies*: Average time that critical-skill positions are vacant due to staff departures per vacancy per year.
- *Key position internal/external recruitment* (percent): 100 X (number of critical-skill positions that are filled internally (through promotion, transfer, etc. rather than outside recruitment) versus filled through outside recruitment ÷ total number of positions filled per year). (This will help the utility to understand if internal workforce development is covering long-term succession needs.)

[7] From AWWA and AwwaRF, *Selection and Definition of Performance Indicators for Water and Wastewater Utilities*, p. 38. 2004. Note: This material is copyrighted and any reprinting must be by permission of the American Water Works Association.

- *Long-term succession plan coverage* (percent): 100 X (number of employees (or cohorts, work units, etc.) covered by a long-term workforce succession plan that accounts for projected retirements and other vacancies in each skill and management area ÷ total number of employees) (or cohorts, work units, etc.).

Operational Optimization

1. Resource optimization

Description: This measure examines resource use efficiency, including labor and material per unit of output or mile of collection/distribution system.

Example calculations:

- *Customer accounts per employee*: Number of accounts ÷ number of FTEs. (FTE = 2,080 hours per year of employee time equivalent.) This is a QualServe Indicator.[8]
- *MGD water delivered/processed per employee*: Average MGD delivered/processed ÷ FTEs per year. This is a QualServe Indicator.[9]
- *Chemical use per volume delivered/processed*: Amount of chemicals used ÷ MG delivered/processed during reporting period. (Alternatively can use dollar amount spent on chemicals ÷ MG delivered/processed; in this case a rolling average for amount spent would account for periodic bulk purchases.)
- *Energy use per volume delivered/processed*: KWH ÷ MG delivered/processed during reporting period. (Alternatively can use dollar amount spent on energy ÷ MG delivered/processed.)
- *O&M cost per volume delivered/processed*: Total O&M cost ÷ MG delivered/processed during reporting period.

A utility can also apply the above resource use per volume delivered/processed calculations to resource use per mile (or 100 miles) of collection/distribution system, (i.e., chemical use per mile, energy use per mile, or O&M cost per mile).

2. Water management efficiency

Description: This measure assesses drinking water production and delivery efficiency by considering resources as they enter and exit the utility system.

[8] Part of the same Indicator (set) as MGD water delivered/MGD waste water processed per FTE. From AWWA and AwwaRF, *Selection and Definition of Performance Indicators for Water and Wastewater Utilities*, p. 40. 2004. Note: This material is copyrighted and any reprinting must be by permission of the American Water Works Association.
[9] Ibid., p. 40.

Example calculations:

- *Production efficiency*: Ratio of raw water volume taken into the treatment system to treated water produced.
- *Distribution system water loss* (a.k.a. non-revenue water) (percent): 100 X [volume of water distributed – (volume of water billed + volume of unbilled authorized water) ÷ total volume of water distributed]. (Quantifies the percentage of produced water that fails to reach customers and cannot otherwise be accounted for through authorized usage.) This is a QualServe Indicator.[10]
- *Meter function* (percent): 100 X (total number of active billable meters minus stopped or malfunctioning meters ÷ total number of active billable meters).

Financial Viability

1. Budget management effectiveness

Description: This measure has short-term and long-term aspects. The short-term calculations are commonly used financial performance indicators, and the long-term consideration is a more comprehensive analytical approach to assessing budget health over the course of several decades.

Example calculations:

Short-term (typically per year):

- *Revenue to expenditure ratio*: Total revenue ÷ total expenditures.
- *O&M expenditures* (percent): 100 X (O&M expenditures ÷ total operating budget).
- *Capital expenditures* (percent): 100 X (capital expenditures ÷ total capital budget).
- *Debt ratio*: Total liabilities ÷ total assets. Total liabilities are the entire obligations of the utility under law or equity. Total assets are the entire resource of the utility, both tangible and intangible. Utilities often have different debt-risk acceptability levels, thus the ratio itself should be considered within each utility's unique circumstances. This is a QualServe Indicator.[11]

[10] From AWWA and AwwaRF, *Selection and Definition of Performance Indicators for Water and Wastewater Utilities*, p. 59. 2004. Note: This material is copyrighted and any reprinting must be by permission of the American Water Works Association.
[11] Ibid., p. 51. 2004.

Long-term:

- *Life-cycle cost accounting*: Has the utility conducted a life-cycle cost accounting analysis[12] that explicitly incorporates accepted service level risks, asset condition, budget needs based on the values (net present values) of utility current and future assets, etc., and made financial and budget management decisions accordingly (yes/no)?

2. Financial procedure integrity

Description: Questions that gauge presence of internal utility processes to ensure a high level of financial management integrity.

Example calculations:

- Does the utility have financial accounting policies and procedures (yes/no)?
- Are financial results and internal controls audited annually (yes/no)?
- Have the number of control deficiencies and material weaknesses been reduced from previous audits (yes/no)?

3. Bond ratings

Description: Bond ratings are a general indicator of financial viability; however, they are not always within a utility's control and are less important if a utility is not participating in capital markets. Smaller utilities often struggle to obtain high ratings. Even though a higher bond rating is desirable and this provides a general indicator of financial health, the bond rating should not be considered alone. It should be considered in light of other factors such as the other measures suggested for this Attribute.

Example question:

- Has your bond rating changed recently? If so, why? Does the change reflect the utility's financial management in a way that can and should be acknowledged and, if need be, addressed?

[12] Section 707 of Executive Order 13123 defines life-cycle costs as, "...the sum of present values of investment costs, capital costs, installation costs, energy costs, operating costs, maintenance costs, and disposal costs over the life-time of the project, product, or measure." Life-cycle cost analysis (LCCA) is an economic method of project evaluation in which all costs arising from owning, operating, maintaining, and disposing of a [facility/asset] are considered important to the decision. LCCA is particularly suited to the evaluation of design alternatives that satisfy a required performance level, but that may have differing investment, operating, maintenance, or repair costs; and possibly different life spans. LCCA can be applied to any capital investment decision, and is particularly relevant when high initial costs are traded for reduced future cost obligations. See also: http://www.epa.gov/EMS/position/eo13148.htm, http://www.wbdg.org/resources/lcca.php.

4. Rate adequacy

Description: This measure helps the utility to consider its rates relative to factors such as external economic trends, short-term financial management, and long-term financial health. It recognizes that a "one size fits all" calculation would not be realistic due to each utility's unique situation and the number of variables that could reasonably be considered. The following three questions prompt assessment of key components of rate adequacy.

Example questions:

- How do your rate changes compare currently and over time with the inflation rate and the Consumer Price Index (CPI) or Consumer Price Index for All Urban Consumers (CPI-U)? (Rate increases below CPI for very long may suggest rates are not keeping up with utility costs.) (Using a rolling rate average over time will adjust for short-term rate hikes due to capital or O&M spending needs.)
- Have you established rates that fully consider the full life-cycle cost of service and capital funding options? (See the life-cycle cost accounting discussion, above.)
- Does your utility maintain a rate stabilization reserve to sustain operations during cycles of revenue fluctuation, in addition to 60- (or 90-) day operating reserves?

Infrastructure Stability

1. Asset inventory

Description: This measure gauges a utility's efforts to assess assets and asset conditions, as the first steps towards building a comprehensive asset management program.

Example calculations:

- *Inventory coverage* (percent): 100 X (total number of critical assets inventoried within a reasonable period of time (e.g., 5-10 years) ÷ total number of critical assets). A utility will need to first define what it considers to be a critical asset and a complete inventory will involve understanding the following for each:
  - Age and location;
  - Asset size and/or capacity;
  - Valuation data (e.g., original and replacement cost);
  - Installation date and expected service life;

- Maintenance and performance history; and
- Construction materials and recommended maintenance practices.[13]

- *Condition assessment coverage* (percent): 100 X (total number of critical assets with condition assessed and categorized into condition categories within a reasonable period of time (e.g., 5-10 years) ÷ total number of critical assets). Condition categories could include: unacceptable, improvement needed, adequate, good, and excellent to reflect expected service levels and accepted risks.

2. Asset (system) renewal/replacement

Description: This measure assesses asset renewal/replacement rates over time. The measure should reflect utility targets, which will vary depending on each utility's determinations of acceptable risks for different asset classes. Decisions on asset replacement typically factor in internally agreed-upon risks and objectives, which may differ by asset class and other considerations. For instance, a utility may decide to run certain assets to failure based on benefit-cost analysis.

Example calculations:

- *Asset renewal/replacement rate* (percent): 100 X (total number of assets replaced per year for each asset class ÷ total number of assets in each asset class). For example, a two percent per year replacement target (50-year renewal) for a particular asset class could be identified as the basis for performance monitoring.

  — *or* —

- *Asset (system) renewal/replacement rate*: 100 X (total actual expenditures or total amount of funds reserved for renewal and replacement for each asset group ÷ total present worth for renewal and replacement needs for each asset group). This is a QualServe Indicator.[14]

3. Water distribution/collection system integrity

Description: For drinking water utilities, this measure quantifies the number of pipeline leaks and breaks. Distribution system integrity has importance for health, customer service, operational, and asset management reasons. For wastewater utilities, this measure examines the frequency of collection system failures. When tracked over time, a utility can evaluate whether its failure rate is decreasing, stable, or increasing. When data are maintained to characterize failures by pipe type and age, type

[13] From the U.S. General Accounting Office, *Water Infrastructure: Comprehensive Asset Management Has Potential to Help Utilities Better Identify Needs and Plan Future Investments*. GAO-04-461. March 2004. Available: http://www.gao.gov/new.items/d04461.pdf.

[14] From AWWA and AwwaRF, *Selection and Definition of Performance Indicators for Water and Wastewater Utilities*, p. 53. 2004. Note: This material is copyrighted and any reprinting must be by permission of the American Water Works Association.

of failure, and cost of repairs, decisions regarding routine maintenance and replacement/renewals can be better made.[15]

Example calculation (drinking water utilities):

- *Leakage and breakage frequency rate* (percent): 100 X ((total number of leaks + total number of breaks) ÷ total miles of distribution piping per year). (Note: leaks and breaks are distinctly different events.) This is a QualServe Indicator.[16]

Example calculation (wastewater utilities):

- *Collection system failure rate* (percent): 100 X (total number of collection system failures ÷ total miles of collection system piping per year). This is a QualServe Indicator.[17]

4. Planned maintenance

Description: Planned maintenance includes both preventive and predictive maintenance. Preventive maintenance is performed according to a predetermined schedule rather than in response to failure. Predictive maintenance is initiated when signals indicate that maintenance is due. All other maintenance is categorized as corrective or reactive.[18]

Example calculations:

This measure can be measured in different ways. Calculating costs may be preferable to encourage business decisions based on total cost; however, the reliability of costs is uncertain. Hours are likely to be less variable than costs, but not all utilities track hours. Thus, cost and hours ratios are desirable, where possible.

- *Planned maintenance ratio by hours* (percent): 100 X (hours of planned maintenance ÷ (hours of planned + corrective maintenance)). This is a QualServe Indicator.[19]
- *Planned maintenance ratio by cost* (percent): 100 X (cost of planned maintenance ÷ (cost of planned + corrective maintenance)). This is a QualServe Indicator.[20]

[15] From AWWA and AwwaRF, *Selection and Definition of Performance Indicators for Water and Wastewater Utilities*, p. 70. 2004. Note: This material is copyrighted and any reprinting must be by permission of the American Water Works Association.
[16] Ibid., p. 61.
[17] Ibid., p. 70.
[18] Ibid., p. 65.
[19] Ibid., p. 66.
[20] Ibid., p. 66.

Operational Resiliency

1. Recordable incidents of injury or illnesses

Description: Incidence rates can be used to show the relative level of injuries and illnesses and help determine problem areas and progress in preventing work-related injuries and illnesses.

Example calculations:

The U.S. Bureau of Labor Statistics has developed instructions for employers to evaluate their firm's injury and illness record. The calculation below is based on these instructions, which can be accessed at: http://www.bls.gov/iif/osheval.htm.

- *Total recordable incident rate*: (Number of work-related injuries and illnesses X 200,000[21]) ÷ employee hours worked.

2. Insurance claims

Description: This measure examines the number, type, and severity of insurance claims to understand insurance coverage strength/vulnerability.

Example calculations:

- *Number of insurance claims*: Number of general liability and auto insurance claims per 200,000[22] employee hours worked.
- *Severity of insurance claims*: Total dollar amount of general liability and auto insurance claims per 200,000[23] employee hours worked.

3. Risk assessment and response preparedness

Description: This measure asks whether utilities have assessed their all-hazards (natural and human-caused) vulnerabilities and risks and made corresponding plans for critical needs. Risk assessment in this context includes a vulnerability assessment regarding, for example, power outages, lack of access to chemicals, curtailed staff availability, etc.

[21] 200,000 hours is a standard number used by OSHA to normalize data. It represents the equivalent of 100 employees working 40 hours per week, 50 weeks per year, and provides the standard base for the incidence rates.
[22] See the explanation in the footnote above regarding the 200,000 hours standard.
[23] See the explanation in the footnote above regarding the 200,000 hours standard.

Example calculations:

- Emergency Response Plan (ERP) coverage and preparedness:
  - Does the utility have an ERP in place (yes/no)?
  - Number and frequency of ERP trainings per year: 100 X (number of employees who participate in ERP trainings ÷ total number of employees).
  - Number and frequency of ERP exercises per year: 100 X (number of employees who participate in ERP exercises ÷ total number of employees).
  - Frequency with which the ERP is reviewed and updated.
- *Vulnerability management*: Is there a process in place for identifying and addressing system deficiencies (e.g., deficiency reporting with an immediate remedy process) (yes/no)?

4. Ongoing operational resiliency

Description: This measure assesses a utility's operational reliability during ongoing/routine operations.

Example calculations:

- *Uptime for critical utility components on an ongoing basis* (percent): 100 X (hours of critical component uptime ÷ hours critical components have the physical potential to be operational). Note: a utility can apply this measure on an individual component basis or summed across all identified critical components. Also, a utility can make this measure more precise by adjusting for planned maintenance periods.

5. Operational resiliency under emergency conditions

Description: This measure assesses the operational preparedness and expected responsiveness in critical areas under emergency conditions.

Example calculations (all apply to emergency conditions and, where relevant, factor in anticipated downtimes relative to required/high demand times):

- *Power resiliency*: Period of time (e.g., hours or days) for which backup power is available for critical operations (i.e., those required to meet 100 percent of minimum daily demand). (Note: "minimum daily demand" is the average daily demand for the lowest production month of the year.)
- *Treatment chemical resiliency*: Period of time (e.g., hours or days) minimum daily demand can be met with water treated to meet SDWA standards for acute contaminants (i.e., *E.coli*, fecal coliform, nitrate, nitrite, total nitrate and nitrite, chlorine dioxide, turbidity as referenced in the list of situations requiring a Tier 1 Public Notification under 40 CFR 141.202), without additional treatment

chemical deliveries. (Note: "minimum daily demand" is the average daily demand for the lowest production month of the year.)

- *Critical parts and equipment resiliency*: Current longest lead time (e.g., hours or days) for repair or replacement of operationally critical parts or equipment (calculated by examining repair and replacement lead times for all identified critical parts and equipment and taking the longest single identified time).
- *Critical staff resiliency*: Average number of response-capable backup staff for critical operation and maintenance positions (calculated as the sum of all response-capable backup staff ÷ total number of critical operation and maintenance positions).
- *Treatment operations resiliency* (percent): Percent of minimum daily demand met with the primary production or treatment plant offline for 24, 48, and 72 hours. (Note: "minimum daily demand" is the average daily demand for the lowest production month of the year.)
- *Sourcewater resiliency*: Period of time (e.g., hours or days) minimum daily demand can be met with the primary raw water source unavailable. (Note: "minimum daily demand" is the average daily demand for the lowest production month of the year.)

Community Sustainability

1. Watershed-based infrastructure planning

Description: This measure addresses utility efforts to consider watershed-based approaches when making management decisions affecting infrastructure planning and investment options. Watershed protection strategies can sometimes, for example, protect sourcewater quality limiting the need for additional or enhanced water treatment capacity.

Example question:

- Does the utility employ alternative, watershed-based approaches to align infrastructure decisions with overall watershed goals and potentially reduce future infrastructure costs? Watershed-based approaches include, for example: centralized management of decentralized systems; stormwater management; sourcewater protection programs; and conjunctive use of groundwater, sourcewater, and recycled water to optimize resource use at a basin scale. (See also "green infrastructure" below.)

2. Green infrastructure

Description: "Green infrastructure" includes both the built and natural/unbuilt environment. Utilities may promote source water protection and conservation "green infrastructure" approaches in support of water conservation (e.g., per capita demand reduction) and water quality protection objectives. Green infrastructure approaches can include: low-impact development techniques (e.g., minimization of impervious surfaces, green roofs); protection of green spaces and wildlife habitat; incentives for water-efficient domestic appliance use and landscaping; green building standards such as those promoted through the Leadership in Energy and Environmental Design (LEED) program; management of energy, chemical, and material use; etc.[24] Utilities often coordinate these efforts with community planning offices.

Example question:

- Has the utility explored green infrastructure approaches and opportunities that are aligned with the utility's mandate, goals, and objectives and community interests (yes/no)?
- Does the utility have procedures that incorporate green infrastructure approaches and performance into new infrastructure investments (yes/no)?

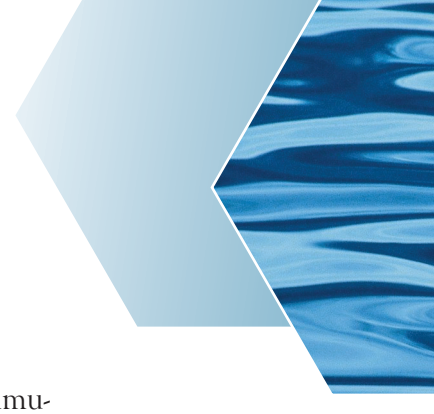
3. Greenhouse gas emissions

Description: This measure will help drinking and wastewater utilities to understand and reduce their individual contributions to area greenhouse gas emissions. Trends indicate that water utility emissions of these gases will likely be of interest to stakeholders. Monitoring of these emissions is becoming more common among water sector utilities, and some utilities are beginning voluntary efforts to reduce their emissions (e.g., through production of reusable methane energy by wastewater utilities).

Example calculation:

- Net (gross minus offsets) greenhouse gas emissions in tons of carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), and, as applicable, hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Start by establishing an emissions baseline and then track emission trends in conjunction with minimizing/reducing emissions over time, where possible.[25] Emissions inventories often incorporate indirect emissions such as those generated during the production and transport of materials and chemicals.

[24] For more information about green infrastructure, visit www.epa.gov/npdes/greeninfrastructure.
[25] EPA's industry-government "Climate Leaders" partnership involves completing a corporate-wide inventory of their greenhouse gas emissions. Information and related guidance is available at http://www.epa.gov/stateply/index.html.



4. Service affordability

Description: Drinking water and wastewater service affordability centers on community members' ability to pay for water services. The true cost of water/wastewater services may be higher than some low-income households can afford, particularly when rates reflect the full life-cycle cost of water services. Each utility will want to consider and balance keeping water services affordable while ensuring the rates needed for long-term infrastructure and financial integrity.

Example calculations and considerations:

- *Bill affordability* (households for which rates may represent an unaffordable level) (percent): 100 X (number of households served for which average water bill is > "X" percent (often 2-2.5%) of median household income[26] ÷ total number of households served).

Coupled with:

- *Low-income billing assistance program coverage* (percent): 100 X (number of customers enrolled in low-income billing assistance program ÷ number of customers who are eligible for enrollment in low-income billing assistance program). (The utility can try to increase participation in the program for eligible households that are not participating.)

Water Resource Adequacy

1. Water supply adequacy

Description: This measure assesses short-term and long-term water supply adequacy and explores related long-term supply considerations.

Example calculations and questions:

- *Short-term water supply adequacy*: Period of time for which existing supply sources are adequate. This can be measured as a ratio of projected short-term (e.g., 12-month rolling average) monthly supply to projected short-term monthly demand. Often an index or scale is used, for example, short-term supply relative to severe drought (assigned a "1") to abundant supply conditions (assigned a "5").

[26] This calculation focuses on identifying low-income households based median household incomes (MHI); however, MHI is not strongly correlated with the incidence of poverty or other measures of economic need. Further, populations served by small utilities in rural settings tend to have lower MHI and higher poverty rates, but fewer options for diversifying water/wastewater service rates based on need compared to larger municipal systems.

- *Long-term water supply adequacy*: Projected future annual supply relative to projected future annual demand for at least the next 50 years (some utilities project out as far as 70-80 years). Statistical forecasting and simulation modeling and forecasting techniques are typically used for such long-term projections. Analysis variables in addition to historical record (e.g., historical and year-to-date reservoir elevation data), forecasted precipitation, and flows can include:
  - Future normal, wet, dry, and very dry scenarios (including anticipated climate change-related scenarios);
  - Anticipated population changes;
  - Future service areas;
  - Availability of new water supplies, including recycled water (plus availability of water rights for new supplies, where applicable); and
  - Levels of uncertainty around the above.

2. Supply and demand management

Description: This metric explores whether the utility has a strategy for proactive supply and demand management in the short and long terms. Strategy needs will depend on community circumstances and priorities, anticipated population growth, future water supply in relation to anticipated demand, demand management and other conservation options, and other local considerations.

Example questions:

- Has the utility developed a sourcewater protection plan (yes/no) and is the plan current (yes/no)?
- Does the utility have a demand management/demand reduction plan (yes/no)? Does this plan track per capita water consumption and, where analytical tools are available to do so, accurately attribute per capita consumption reductions to demand reduction strategies (such as public education and rebates for water-efficient appliances) (yes/no)?
- Do demand scenarios account for changes in rates (which can change for many reasons) and conservation-oriented, demand management pricing structures (yes/no)?
- Does the utility have policies in place that address, prior to committing to new service areas, availability of adequate dry year supply (yes/no)? Alternatively, does the utility have a commitment to denying service commitments unless a reliable drought-year supply, with reasonable drought use restrictions, is available to meet the commitment (yes/no)?

Stakeholder Understanding and Support

1. Stakeholder consultation

Description: This measure addresses utility actions to reach out to and consult with stakeholders about utility matters, including utility goals, objectives, and management decisions.

Example questions:

- Does the utility identify stakeholders, conduct outreach, and actively consult with stakeholders about utility matters (yes/no)? Elements of this plan can include:
  - Number of active contacts with stakeholders in key areas (e.g., from local government, business, education, non-governmental groups)?
  - Does the utility actively seek input from stakeholders (yes/no)?
  - Frequency with which the utility actively consults with stakeholders. This measure should go beyond counting the number of calls or times information is sent out or posted on websites to items such as number of stakeholder outreach and education activities, number of opportunities for stakeholders to provide input, participation of stakeholders on utility committees, etc.
- Does the utility actively consider and act upon stakeholder input (yes/no)?

2. Stakeholder satisfaction

Description: This measure addresses stakeholder perceptions of the utility. Stakeholder satisfaction can be measured through surveys sent to stakeholders, formal feedback surveys distributed to stakeholders at events, etc.

Example calculations:

- *Overall satisfaction* (percent): 100 X (number of stakeholders who annually rate the overall job of the utility as positive ÷ total number of stakeholders surveyed).
- *Responsiveness* (percent): 100 X (number of stakeholders who annually rate utility responsiveness to stakeholder needs as positive ÷ total number of stakeholders surveyed).
- *Message recollection for outreach programs targeted to specific stakeholder groups* (percent): (a) 100 X (number of stakeholders who recall key messages ÷ total number of stakeholders surveyed); and (b) 100 X (number of stakeholders who recall the message source (TV, utility mailers, newsletters, etc.) ÷ total number of stakeholders surveyed).

3. Internal benefits from stakeholder input

Description: This measure addresses the value utility employees believe stakeholder engagement has provided to utility projects and activities. Measurement by the utility can focus on surveying utility employees running projects that have stakeholder involvement.

Example calculations:

- 100 X (number of utility projects or activities where stakeholders participated and/or provided input for which utility employees believe there was value added as a result of stakeholder participation and input ÷ total number of projects where stakeholders participated and/or provided input).
- *Overall value added* (percent): 100 X (number of utility employees who rated their overall sense of value added from stakeholder participation and input as (high value added, some value added, little value added, no value added) ÷ total number of utility employees surveyed).

4. Comparative rate rank

Description: This measure depicts how utility rates compare to similar utilities (e.g., utilities of the same type (drinking water, wastewater) that are similar in terms of geographic region, size of population served, etc.). A utility can use the measure internally or to educate stakeholders. It should be noted that the lowest rate is not necessarily best (see Financial Viability).

Example calculations:

- Typical monthly bill for the average household as a percentage of typical monthly bills for similar area utilities.

5. Media/press coverage

Description: This measure captures media portrayal of the utility (newspaper, TV, radio, etc.) in terms of awareness, accuracy, and tone.

Example calculations:

- *Amount of coverage*: Total number of media stories (newspaper, TV, radio, etc.) concerning the utility per year.
- *Media coverage tone* (percent): 100 X (number of media stories concerning the utility that portray the utility in a positive way ÷ total number of media stories concerning the utility) per year.
- *Media coverage accuracy* (percent): 100 X (number of media stories that accurately describe the utility ÷ total number of media stories concerning the utility) per year.

Effective Utility Management: A Primer for Water and Wastewater Utilities

EWERS engineering

MEMORANDUM

DATE:	June 15, 2015	PROJECT NO:	108-14-002
TO:	Joseph Carlini, Public Works Director City of Tulare	PROJECT:	City of Tulare Wastewater Division Financial Planning Project
FROM:	Chris Ewers, P.E.		
SUBJECT:	Assumptions and Policies, Wastewater Div. 20-year CIP and risk assessment tool		

As you saw last week, Ewers Engineering has developed a spreadsheet-based financial model and risk assessment tool to communicate the impact of funding, defunding, or partially funding projects in a Capital Improvements Plan (CIP) over a 20-year time frame. The financial model incorporates the projects from the City's CIP, pairs them with risk elements (outlined below), and assesses the overall risk to the City for each year of a given level of funding. We have made the model output available to the City as part of the Financial Planning Project for the Wastewater Division.

The City will get analyses that are easy-to-understand graphics showing the risks completed and remaining for each level of annual funding evaluated, the financing costs required for completing the CIP, detailed project sheets for most of the CIP projects, and a list of the projects sorted by risk level to help prioritize the projects for the Wastewater Division managers. The tool draws on projects outlined and reviewed by the City in its draft CIPs and those developed by Ewers Engineering in its benchmarking work.

The financial and risk models used to develop this tool include a range of assumptions and calculations; the purpose of this memo is to document them. Effectively, many of the assumptions illustrate policies necessary to obtain the results projected in the financial model. We anticipate the City will need to discuss these assumptions to accept the model's analytical results.

Background

The CIP represents the City's best projection of projects required to maintain or provide expanded capacity or capability to match the community's goals. For the Wastewater Division, the CIP is focused entirely on the Wastewater Treatment Facility (WWTF), which is composed of the Domestic Wastewater Treatment Plant (DWWTP) and the Industrial Wastewater Treatment Plant (IWWTP). Both WWTPs are relatively new, having been expanded or constructed within the past 10 years. They have also been capital-intensive, together with the new industrial collection system accounting for approximately $162 million in debt for the City at the beginning of 2015. That level of debt reflects their importance to the community; these plants are vital to the well-being of residents and the capacity of the industries in town to conduct their business.

The projects included in the CIP are primarily operations and maintenance (O&M) projects that are large enough to require capitalization for funding outside of the O&M budget. Seven of the 102 projects included are classic capital projects that would expand the capacity or capability of the WWTF.

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The City has set a CIP spending limit of $500,000 per year until fiscal year 2020-2021. A single ongoing CIP O&M project, the scheduled replacement of the diffused-air flotation heads in the sequencing batch reactor of the IWWTP will absorb almost all of this budget, exposing the City to significant risk by not addressing the other projects. We developed the spreadsheet tool to illustrate that risk exposure, communicate it, and permit the City to establish the level of funding in line with both the City's goals and the risk it is willing to undertake.

The financial model

The spreadsheet model is cost-based. Funding mechanisms are not represented in the model, though the model is intended to provide the basis for an understanding of the adequacy of rates and other revenues to accommodate the predicted costs.

Project estimates were developed based on three sources of projects for your Wastewater Division: the five-year CIP developed in early 2015, long-term and large-scale capital projects summarized by City Manager Don Dorman, and projects developed by Ewers Engineering from observations and conversations during two separate tours of the WWTF in 2015. Where the City provided project estimates, they are assumed to be sufficiently accurate for development of a conceptual project. We did not evaluate the City-provided estimates or their development and have not vetted their accuracy.

Projects were categorized according to their impact on the City budget, per the following table.

Table 1: CIP project categories

Type	*Project description*
1	Ongoing, periodic costs or a cost over several years in a programmed O&M expenditure
2	One-time costs, typically for large O&M projects
3	Large capital projects that expand capacity or capability of the WWTF

Type 3 projects are typically characterized by a large capital price tag and require the City to decide if the project should be debt-financed (paid after construction), pre-paid (through accumulated revenue), or a mixture of the two.

The risk model

Adding risk assessment to the financial model highlights risk impacts to the City based upon funding decisions. Per our discussions in the past month, risk has been assessed for all 95 Type 1 and Type 2 projects for four factors: likelihood of failure (LoF), consequence of failure (CoF), the degree of ignorance/unknown about the project, and the criticality of the project to the agency.

Each of the risk elements was provided with a range of values, 1-5, to mimic the National Association of Sanitary Sewer Companies' (NASSCO's) Pipeline Assessment and Certification Program (PACP) rating, with 1 indicating no increase in risk, and 5 being the maximum. To enhance comprehension, the numerical range for each risk element was limited to high, medium, and low (5, 3, and 1, respectively).

Tables 2, 3, 4, and 5 below summarize the risk factors used.

Table 2: Likelihood of failure rating values	
Rating	***Definition***
5	High: Near certainty of short-term failure.
3	Medium: Failure will occur in long term.
1	Low: Failure will occur beyond timeframe affected by CIP.

Table 3: Consequence of failure rating values	
Rating	***Definition***
5	High: Failure disrupts mission, imposes crippling penalties.
3	Medium: Failure generates long-term disruption and increased cost.
1	Low: Failure disruption is negligible.

Table 4: Ignorance rating values	
Rating	***Definition***
5	High: No data are available, nor are data anticipated.
3	Medium: Data are available that indirectly inform the factor.
1	Low: Data are available that directly inform the factor.

Table 5: Criticality rating values	
Rating	***Definition***
5	High: Facility and project are integral to immediate operation.
3	Medium: Facility and project are important for long-term operation.
1	Low: Facility and project have minimal impact on operation.

Exhibit A provides a list projects ranked by risk. The list was developed by calculating a raw risk score for each project and then scaling the score to a range of 1-5 to provide an accessible format for consideration.

The raw risk assessment calculations for each CIP project were developed by multiplying the LoF and CoF, and scaling the result with the criticality and ignorance value.

$$\text{Risk}_{Project} = [(LoF) \times (CoF)] \times [Criticality \times Ignorance]$$

The range of results from any single project's raw risk rating calculation is 1 to 625 (1^4 to 5^4). These are non-linear calculations, resulting in non-linear expansion of risk.

The resulting raw risk score was scaled to a range of 1-5 by taking the log of the raw risk for each project.

(Note that Type 3 projects have risks associated with them that are independent of the factors discussed above and are largely beyond the CIP's timeframe. For these reasons, Type 3 projects have not been assessed for risk.)

ASSUMPTIONS

1. Project costs increase with the level of ignorance and complexity of the project.

Engineering judgment must be used when selecting a design contingency for a given project, but overall, the project estimate should include a contingency that correlates with the degree of ignorance about the project, per Table 6.

Table 6: Best practices design project contingency selection

Project phase	*Phase description*	*Range of estimating contingency*
Conceptual design	Multiple concepts analyzed, being evaluated.	35% - 50%
Facility planning	Overall scope known, processes being evaluated.	20% - 30%
Preliminary design	Design documents 15-30 percent complete.	15% - 20%
Final engineer's estimate	Design documents 90-100 percent complete.	0% - 10%

A construction contingency of 5-10 percent should also be considered for each project based on the likelihood that additional construction effort or materials will be required after the completion of the design documents. This is particularly true with underground construction, where soil composition, contamination, and previously installed improvements unknown to the design team can add considerably to the construction cost.

Implementation: Each project sheet developed in the financial model spreadsheet includes a project design contingency factor, and each of these factors were set by the project phase as per Table 2. No construction contingency was added, but a construction profit multiplier of 10 percent was included for projects that would be built with external forces. This effectively doubles as a construction contingency. (Note that City-provided project estimates do not include contingencies.)

2. Costs increase with time because of inflation; cash reserves have a small yield in return on investment.

We assume that project costs are estimated for the date of construction stated in 2015 dollars. As construction is delayed, inflation increases the project costs. Similarly, if Type 3 projects are financed on a pay-as-you-go basis, the City can expect its set-aside revenues to yield returns every year until they are spent on the capital costs.

Determination of rates

- Inflation: In the past five years, Engineering News Record's Construction Cost Index inflation rate has varied between 2.6 and 3.4 percent per year. Because the economy is warming up, and inflation has been at historic lows for many years, we expect the overall future inflation rate to be higher. An inflation rate of 3.5 percent per year was selected for the 20-year

projection period. This rate is conservative in context of the past five years, but low in the context of previous decades.

- Rate of return on investment: The City's Finance Department helped estimate the rate of return on investment based on the rate of return obtained in the recent past and an expectation of a slight increase on rate of return in the next 20 years. The rate selected was 1.2 percent per year.

3. Highest-risk projects will be completed first.

The compiled projects are sorted by calculated risk level, and the projects that represent the highest risk to the City are funded first.

4. Not constructing a project exposes the City to risk.

Using the risk model described above, the City's exposure to risk can be encapsulated as the sum of the risks associated with all the projects not funded and completed (the risk remaining).

5. Failure risk increases with time.

Utility managers typically understand their utility and base CIP project requirements and timelines on when a facility or component needs the improvement to prevent failure. It makes sense, then, that the longer a project is delayed beyond the originally scheduled completion, the greater the risk of failure. (None of the other risk factors increase in this way.) To model this risk increase, the likelihood of failure is increased for every five years of delay.

6. Type 3 projects will be considered separately.

The large scale of the Type 3 projects (replacement of the WWTF, for instance) and the long timeframe for their implementation in many cases (approximately 80 years for replacement of the WWTF) magnifies the financial impact of Type 3 projects to annual budgets. The City's understanding of the financial impact of funding the Type 1 and Type 2 projects will facilitate a discussion about how much of the Type 3 projects and which projects should be pre-paid.

In summary, Ewers Engineering has made its CIP/risk assessment tool output available to the City to help the City align its financial commitment with its goals and the level of risk it is willing to undertake for its WWTF. We have synthesized financial and risk models to help the City decide what future funding level will best serve its goals, understanding that the City will need to determine whether revenues should be increased to support those funding levels in the future. To fully support the City, we have provided a summary of the assumptions used to develop these tools and look forward to discussing the output of the CIP/risk assessment tool with the City.